

# BOEING 747 TRIBUTE



- FIREFIGHTING JUMBOS
- BEST-SELLING VARIANT
- FANTASTIC FREIGHTERS
- PAN AM 747SPs

EXCLUSIVE

## FLYING THE JAVELIN

Cold War Interceptor



## NORWEGIAN ORIONS

Northern Guardians



**SALVAGE**

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C-5A Retired







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Cover photos (main image): **British Airways Boeing 747-400**. Key-Dino Carrara. Inset (bottom left): **RAF Gloster Javelin FAW.9**. Adrian M Balch Collection. Inset (bottom right): **A Royal Norwegian Air Force P-3C Orion**. Lieuwe Hofstra

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# Airbus 'BLADE' Makes Maiden Flight



New technology that aims for a 50% reduction of wing friction and up to 5% lower CO<sub>2</sub> emission is being trialled over France.

Airbus' A340 laminar-flow 'BLADE' test demonstrator aircraft (A340-300 F-WWAI, MSN001) made a successful maiden flight for the EU-sponsored Clean Sky 'Blade' project on September 26. The aircraft took off from Tarbes airport in southern France and landed, after a series of successful tests, at the manufacturer's facilities in Toulouse Blagnac. The overall flight time was 3hrs 38mins.

**The A340 Flight Lab over France on its maiden flight for testing technology which could improve aviation's ecological footprint and reduce wing friction.** © AIRBUS 2017 – photo by S. RAMADIER

The 'BLADE' project – which stands for Breakthrough Laminar Aircraft Demonstrator in Europe – is tasked with assessing the feasibility of introducing the technology for commercial aviation.

Airbus' A340 Flight Lab is the first test aircraft in the world to combine a transonic laminar wing profile with a true internal primary structure.

On the outside, the aircraft is fitted with two representative transonic laminar outer-wings, while inside the cabin a

highly complex specialist flight-test-instrumentation (FTI) station has been installed.

A key goal is to be able to measure the tolerances and imperfections which can be present and still sustain laminarity. To this end, Airbus will simulate every type of imperfection in a controlled manner, so that at the end of the campaign the tolerances for building a laminar wing will be fully known. The aircraft will perform around 150 flight hours in the coming months.

## Qatar Typhoon Order Nears

Qatar has signed a statement of intent (SOI) to buy 24 Eurofighter Typhoons. The Middle Eastern nation is in the process of modernising and expanding its air arm, the Qatar Emiri Air Force (QEAF), which currently has a frontline fighter force of just 12 Mirage 2000-5EDA/DDA jets that entered service in 1997.

UK Defence Secretary Sir Michael Fallon signed the SOI with his Qatari counterpart Khalid bin Mohammed al

Attiyah in Doha on September 17.

The bid to sell Typhoons to Qatar is being led by BAE Systems and if the deal is concluded it will represent the UK's first major defence contract with the Gulf state. It would keep the Typhoon production line at Warton, Lancashire, active beyond 2019.

At the time the statement was announced, it was suggested that a deal could be finalised and signed in around a month.

Qatari interest in the Typhoon comes hot on the heels of deals to acquire fighters from France and the US: the Dassault Rafale and Boeing F-15QA, respectively.

A \$12bn agreement was concluded in June for the acquisition of 36 F-15QAs, a variant of the F-15E Strike Eagle tailored to Qatari requirements. In April 2015 an agreement was announced for the QEAF to acquire 24 Rafales worth an estimated €6.3bn.

## Farewell to USAF's Last C-5A Galaxy

The last C-5A Galaxy in USAF service flew into retirement on September 7. The giant airlifter left Westover Air Reserve Base in Massachusetts bound for 'the boneyard' at Davis-Monthan AFB, Arizona.

Aircraft 70-0461, from 439th Airlift Wing from Air Force Reserve Command, was originally bound for the museum at Wright-Patterson AFB, Ohio. However, it could not be supported there and was rerouted to the 'boneyard'.



**The USAF's last C-5A Galaxy after delivery to Davis-Monthan AFB, Arizona and the resident 309th Aerospace Maintenance and Regeneration Group.** USAF/Airman 1st Class Frankie D Moore

The first Lockheed C-5A Galaxy went to the 437th Airlift Wing in June 1970 and

a total of 76 C-5As were delivered to the air force.



# Monarch Airlines Collapses



Nearly 900,000 customers were directly affected when Monarch Airlines ceased trading at 4am on October 2.

News of the company's demise was announced in the early hours at a time when all the company's aircraft were on the ground. The business passed into the hands of the administrators, which does not have an Air Operator Certificate, so the closure could not be effected if any aircraft were airborne.

The Civil Aviation Authority launched a rescue of the 110,000 customers abroad, while 750,000 people were told their bookings had been cancelled.

**The CAA arranged aircraft, including Plus Ultra's A340 EC-MFA, to bring home Monarch Airlines' customers after the carrier ceased trading overnight.** AirTeamImages.com

The administrators made 1,858 employees of Monarch Airlines and Monarch Travel Group immediately redundant. Monarch fell victim to a price war, made worse by security concerns in the tourist destinations of Tunisia, Egypt and Turkey and a drop in the value of the pound.

Monarch Aircraft Engineering Limited is not in administration and continues to trade normally.

## Serious A380 Engine Incident

An Air France Airbus A380 was forced to make an emergency landing at Goose Bay Airport, on Canada's eastern seaboard, after the No.4 Engine Alliance GP7200 suffered serious damage over the Atlantic. Images posted online showed a missing nose cowl, fan cowl and fan disc.

The Paris to Los Angeles service, flight number AF66, was carrying 496 passengers and 24 crew on September 30. Customers were transferred to two other aircraft to complete their journey. Air France said the pilots and cabin crew handled the situation 'perfectly'. The carrier confirmed it was part of the investigation team, which also includes Airbus, being led by the French Accident Investigation Bureau.

Engine Alliance said on Twitter it was working with investigators to assess the situation.

## CAA Monitoring Ryanair

The UK aviation regulator, the Civil Aviation Authority (CAA), has said it will continue to monitor Ryanair. It stepped in after the Irish airline cancelled many thousands of flights, affecting hundreds of thousands of travellers because of crew shortages caused by new aviation rules.

The CAA launched enforcement action against the company on September 27 for what it called "persistently misleading passengers with inaccurate information regarding their rights in respect of its recent cancellations".

Two days later, the CAA Chief Executive Andrew Haines, said: "We can confirm we have received correspondence from Ryanair late this afternoon.

"Our job is to protect passengers' rights and ensure that all airlines operating in the UK are fully compliant with important consumer laws.

"Where we find that an airline is systematically flouting these rules, we will not hesitate to take action, to minimise the harm and detriment caused to passengers, as we have done with Ryanair in recent days. It appears that Ryanair has now

capitulated. We will review their position in detail and monitor this situation to ensure that passengers get what they are entitled to in practice."

Ryanair said it had agreed to meet its requirement for customer clarification on its EU261 obligations, which sets out passengers' rights when subject to delays and cancellations.

In a letter to customers affected by the cancellations, Ryanair Chief Executive Michael O'Leary wrote: "... we wish to apologise sincerely for the inconvenience we caused you."

## Italian Atlantic Era Ending

A ceremony at Sigonella air base, Sicily, on September 21, 2017, marked the end of an era for the Aeronautica Militare (Italian Air Force) Breguet Br.1150 Atlantic.

The maritime patrol aircraft (MPA) was bade farewell by 41° Stormo (Wing). The aircraft, operated by a mixed air force and navy crew of 13, will continue to fly through November, even though its final operational flight is planned for October. It will then be retired after 45 years' service and more than 250,000 flight hours.

The P-1150, as the Atlantic is designated in accordance with the Italian Mission Design Series, will be partially replaced by the new P-72A. This is a military variant of the ATR 72-600, but it lacks an anti-submarine warfare (ASW)



**During the ceremony at Sigonella, 88° Gruppo of 41° Stormo unveiled Atlantic MM40118/41-03 in a special scheme to mark the end of service.** David Cenciotti

capability and is considered as a 'gap filler' until the funds to procure a long-

range MPA with ASW capabilities are available. **David Cenciotti**



# New F-35 Squadron at Hill AFB



A new Lockheed Martin F-35A Lightning II squadron stood up at Hill Air Force Base, Utah, on September 27 when the initial Lightning II for the unit was delivered to the 4th Fighter Squadron and 4th Aircraft Maintenance Unit. The aircraft was flown in by Lt Col Yosef Morris, 4th Fighter Squadron commanding officer.

Currently the 4th Aircraft Maintenance Unit has six aircraft allocated to it from the parent 388th Fighter Wing's 34th Fighter

**Members of the 388th Fighter Wing's 4th Aircraft Maintenance Unit drag chocks to the aircraft as Lt Col Yosef Morris, 4th Fighter Squadron commander prepares to deplane after delivering the jet to Hill AFB from the Lockheed Martin factory on September 27.**

USAF/Todd Cromar

Squadron, and its personnel received training from the 34th Aircraft Maintenance Unit.

"This jet marks the end of an era and the

start of the future for the 388th and 419th Fighter Wings," said Lt Col Morris. "Both wings are now one hundred per cent F-35 units, with the last F-16s leaving the base last week." For more see the story opposite.

The first operational F-35A Lightning IIs arrived at Hill AFB in October 2015. The base currently has assigned 27 F-35As and will eventually be home to 78 Lightning IIs and three operational squadrons by the end of 2019.

## Mirage F1s Sold to Draken

Twenty Mirage F1s, previously owned by the Spanish Air Force, have been bought by Draken International. They will complement its existing fleet, which includes L-39s, L-159Es, A-4K/TA-4K and A-4N Skyhawks, MB339CBs and MiG-21bis and MiG-21UMs in the adversary role. The company is supporting training efforts with 'Red Air' assets at the USAF Air Warfare Center at Nellis AFB, Nevada. The contractor expects to equip the F1s with a helmet-mounted cueing system, infra-red missile seekers, datalinks and electronic jamming and radar warning receiver capabilities.

## Leonardo Joins ASDOT Bidding Consortium

Leonardo is now part of the Discovery Air Defence and Inzpire pitch to supply aggressor aircraft for the UK MOD's Air Support to Defence Operational Training (ASDOT) programme. The companies announced the move at the Defence and Security Equipment International (DSEI) event in London on September 12. Between them, the firms will offer the MOD a "customer-centred, low-risk, live air training solution" to meet ASDOT's live-fly tactical training requirement until the mid-2030s. Discovery and Inzpire first announced their joint proposal for ASDOT in February. Other consortia are also interested in bidding for ASDOT.

## Bangladesh Army C295W Delivered



An Airbus Defence and Space C295W for Bangladesh Army Aviation passing through Malta International Airport on September 14. The aircraft, S3-BRT (c/n 170, with temporary civil registration EC-006), was on its delivery flight from Seville. Airbus Defence and Space announced an order for a single C295W for the Bangladesh Army on October 11, 2016. The aircraft is in standard transport configuration and is likely to be operated by the Fixed Wing Battalion at Bangladesh Air Force Base Bangabandhu in Kurmitola, north of Dhaka. Alistair Zammit

## Phénix Tanker Gets Airborne

The first Airbus Defence and Space A330 Multi-Role Tanker Transport (MRTT) for the French Air Force performed its maiden flight on September 7. The type will be called Phénix in French service.

The Phénix fleet will be equipped with a combination of the Airbus Aerial Refuelling Boom System and underwing hose-and-drogue refuelling pods. When in service the type will be able to carry 272 passengers or be configured for medical evacuation.

The French Air Force has placed an order for nine of these aircraft and also has three options. First delivery is due in 2018.



# HeliOperations Sea Kings

A new colour scheme for service with HeliOperations has been applied to two former Royal Navy Sea King HU5s. The helicopters are being leased from the MOD's Defence Equipment and Support under a contract between Navy Command, the German government and HeliOperations to undertake Sea King Mk41 aircrew training for the German Marineflieger (German Naval Aviation).

The Sea Kings are to be operated from Portland, Dorset, under the company's Contractor Flying Approved Organisation Scheme. **Lee Howard**

**Former 771 Naval Air Squadron Sea King HU5 XV666 undergoes a ground run at Vector Aerospace Fleetlands on September 6 wearing its new colour scheme for operations with HeliOperations.** Lee Howard



## Shadows to be Modernised

A comprehensive upgrade of the Shadow R1 intelligence, surveillance and reconnaissance (ISR) aircraft, operated by the RAF's 14 Squadron at RAF Waddington, Lincolnshire, has been announced. A long-term arrangement has been signed between the RAF and prime contractor Raytheon UK.

Five Shadows are currently in use, and the 2015 Strategic Defence and Security Review included a commitment to acquire another three.

Modernisation of new and existing aircraft, which are based on the Beechcraft King Air 350CER airframe, is currently at the concept stage. According to Raytheon, the company

"will make the first incremental upgrade to the Shadow R1 and then explore new delivery solutions for the next variant, the Mk 2".

The RAF's planned out-of-service date for the Shadow is 2030 and a long-term support contract for the type is currently being negotiated with Raytheon. This is due to begin in April 2019.

## Goodbye F-16

A 'Viper Out' ceremony was held as the 388th and 419th Fighter Wings at Hill AFB, Utah, formally said farewell to the F-16 on September 8. The last F-16Cs operated by the two wings departed the base on September 21. The 388th was the first operational USAF wing to fly the Fighting Falcon after receiving its initial F-16A/Bs in 1979.

## Argentina Receives First Texans



**Texan II aircraft are being delivered to the Fuerza Aérea Argentina (FAA – Argentine Air Force). The first four of an order for 12 were handed over on September 27. The trainers will wear the FAA serials E-300 to E-311. A second purchase of another 12 aircraft is planned.** Juan Carlos Cicales

## Gripen Aggressor Unveiled

Saab brought a full-scale model of its Gripen Aggressor concept to the Defence and Security Equipment International (DSEI) exhibition in London during September.

The multi-role fighter is based on the proven Gripen C series and is described by the company as the "ultimate platform for the adversary air combat training market".

Saab sees potential for the aircraft as a high-level aggressor option within both the United States Air Force's Adversary Air (ADAIR) and the UK MOD's Air Support to Defence Operational Training (ASDOT) requirements, as well as for users looking to prepare pilots for the challenges of sophisticated modern air combat.

## Two Nations Join Transport Pool

A firm order for five more Airbus A330s MRTTs (Multi-Role Tanker Transports) has been placed by Europe's organisation for the management of cooperative armament programmes – OCCAR – on behalf of the

NATO Support and Procurement Agency (NSPA) and funded by Germany and Norway.

The two nations are joining the Netherlands and Luxembourg in the European/NATO Multinational Multi-Role

Tanker Transport Fleet programme. The latter is funded by the four countries that will have the exclusive right to operate these NATO-owned aircraft in a pooling arrangement.



## Upgraded Lynx Back in the Air



The first of eight Super Lynx undergoing a major modernisation for the Marinha do Brasil (Brazilian Navy) has made its first flight. The AH-11B Super Lynx, N-4001 (c/n 378), took to the air at Leonardo Helicopters' Yeovil facility, in Somerset, on September 28.

The company is updating eight AH-11As

**The Brazilian Navy's first upgraded Super Lynx AH-11B on its maiden flight at Yeovil on September 28. The helicopter is wearing the UK military serial ZH962.** Leonardo Helicopters

(Mk21As) as part of a \$132m contract signed in June 2014. The first three upgraded aircraft will be delivered next year.

## POTUS 'Air Force One' Contract Award

Preliminary design work on modifications of the two Boeing 747-85M aircraft that will replace the current 747-200-based VC-25A presidential support aircraft is due to begin. Boeing received a \$600m contract modification from the Air Force Life Cycle Management Center for the task.

The VC-25As are known as 'Air Force One' when carrying the President of the United States (POTUS). Modifications to the 747-8 aircraft, including the incorporation of a mission communications system, electrical power upgrades, a medical facility, an executive interior, self-defence system and autonomous ground operations capabilities will be carried out under a future contract modification.

The two 747-8 aircraft are scheduled to enter service in 2024.

## RSAF Training in Australia Extended

RAAF Base Pearce in Western Australia will continue to be used by the Republic of Singapore Air Force (RSAF)'s Flying Training Institute for another 25 years. An upgrade to an existing memorandum of understanding permits the institute's 130 Squadron and

Standards Squadron to conduct training from the base until 2043.

The former unit runs the Basic Wings Course for pilot trainees, while the latter trains and qualifies flying instructors.

Airspace constraints and monsoons

often hampered training opportunities in Singapore, and in 1993, the Flying Training School and 29 Aermacchi S.211 trainers moved to Pearce, joining No 2 Flying Training School, the RAAF's main training school for its pilot cadets. **Roy Choo**

## MiG-29SMT Sent to Syria

MiG-29SMT multi-role fighters have been deployed to Syria for the first time by the Russian Aerospace Forces (VKS – Vozdushno-Kosmicheskoye Sily). Photos and video footage released by the Russian defence ministry on September 13 confirmed the presence of at least three of the fighters at Hmeymim air base in Syria's Latakia province.

Since the Russian intervention in Syria began in September 2015, the VKS has flown almost 31,000 missions and undertaken nearly 14,000 air strikes.

## Two Grob G 120TPs for ETPS

Two Grob G 120TP trainers will complete the modernisation of the Empire Test Pilots' School (ETPS) fleet. QinetiQ confirmed the £6m deal on September 12. The Grob aircraft will join the ETPS fleet alongside two new Pilatus PC-21s and four Airbus H125 helicopters, ordered in December 2016 and March this year respectively. The G 120TPs will be used to train flight test engineers throughout all stages of their development.

## Bahrain to Increase F-16 Fleet

An order for 19 new-build F-16V fighters for Bahrain has been approved by the US government. The deal also includes an upgrade of its current fleet of 20 F-16C/Ds to the same standard. If carried out in full, the total package could be worth \$3.9bn.

Previous efforts to approve the sale of the F-16V to Bahrain were held up by the former Obama administration due to concerns over alleged human rights abuses. However, in late March the Trump administration notified Congress that the sales could proceed.

## Harbins Delivered to Mali



Two Harbin Y-12s have been received by the Armée de l'Air Malienne (Mali Air Force). TZ-WAA (to become TZ-21T) and TZ-WAB (TZ-22T) passed through Malta International Airport on September 18. The aircraft departed Guilin Liangjiang IAP for Kunming Wujiaaba IAP in China, with subsequent stops in Myanmar, Pakistan (two stops), India (three stops), Oman, Bahrain, Saudi Arabia, Cairo and Heraklion before touching down in Malta. The aircraft departed Luqa for Houari Boumediene Airport in Algiers, before arriving in Mali. Alistair Zammit





We've conquered the forces  
of nature to bring you calm  
blue skies.

## Mi-28NE

The Mi-28NE combat helicopter provides round-the clock accomplishment of combat missions, deploying all types of weapons in various climatic zones as well as in mountainous terrain.

# New York Jets' A320



JetBlue has painted an A320 in the colours of the New York Jets team which plays in the American National Football League. It came out of the paint facility at Mobile, Alabama on September 20 and began revenue flights the next day. It is pictured arriving at Newark Liberty International Airport. The carrier is based in New York City. Cary Liao

## Mitsubishi MRJ Testing Resumes

Test-flying of Mitsubishi Aircraft's MRJ has restarted following the grounding of its four US-based trial fleet on August 21. The manufacturer took the precaution of suspending flights following an uncommanded shutdown of the port Pratt & Whitney PW1200G-geared turbofan

engine on test aircraft two (FTA-2), JA22MJ (c/n 10002) while flying over the Pacific Ocean, 90 miles (145km) west of Portland, Oregon.

The aircraft involved diverted to Portland International Airport where it landed without incident.

A Mitsubishi spokesperson said that FTA-4, which had been operating from Phoenix-Mesa Gateway Airport, had resumed flight testing on September 4.

The first MRJ90 is due to be delivered to launch customer All Nippon Airways in mid-2020.

## Schiphol Set to Grow

The first permanent expansion of Amsterdam Airport Schiphol is on the drawing board. KAAAN Architecten has been selected to design its new terminal A. The facility, which will be developed in collaboration with ABT, Estudio Lamela and Ineco, is slated to open in 2023 and will increase the Dutch hub's capacity by 14 million passengers per year.

Schiphol CEO Jos Nijhuis remarked:

"This design suits the Schiphol DNA. It contributes to excellent processing, it provides optimal support to passengers, contributes to our sustainability ambitions and is future-proof. We are looking forward to welcoming airlines and passengers in the new terminal and adjacent new pier."

The new facility will be linked to the existing terminal complex (adjoining the current Departure and Arrival Hall 1),

enabling the airport to maintain a 'one terminal' concept it claims "enhances connection opportunities and reduces transit time".

The construction work, which is being carried out under the Royal Schiphol Group's Capital Programme, marks the first permanent expansion of Schiphol since Departure Halls 3 and 4 and Arrival Halls 3 and 4 were built in 1993.

## Air Mauritius A350 Takes to the Air



Freshly painted Air Mauritius A350-900 3B-NBP (c/n 145) took its maiden flight on September 22 from Toulouse Blagnac, France. It is one of two acquired by the airline from lessor AerCap. Another four have been ordered directly from Airbus. AirTeamImages.com/Javi Sanchez Utzet

## Airbus in China Landmark

Airbus has inaugurated its A330 Completion and Delivery Centre (C&DC) in Tianjin, China. At the same time, the first A330 to be delivered from the C&DC was handed over to Tianjin Airlines.

Located at the same site as the Airbus Tianjin A320 Family Final Assembly Line and the Airbus Tianjin Delivery Centre, the A330 C&DC covers aircraft completion activities including cabin installation, aircraft painting and production flight test, as well as customer flight acceptance and aircraft delivery.



# ANA Introduces A321neo into Service



ANA's first A321neo is in service on domestic Japanese routes. Airbus

All Nippon Airways (ANA) has put its first Airbus A321neo into service, operating out of its Tokyo/Haneda hub. The carrier is the launch customer of the variant powered by Pratt & Whitney PW1100G-JM geared turbofan engines. The aircraft, JA131A (c/n 7839), was accepted at the manufacturer's Hamburg/Finkenwerder facility on September 5, and arrived in Japan three days later, entering service on domestic routes on September 11.

The airline has configured its A321neos

to carry 194 passengers in a two-class layout with eight Premium Class seats and 186 in Economy.

ANA said adding the A321neo to its fleet gives it greater flexibility, enabling it to better respond to the varying demand for seats on certain routes by using the right-sized aircraft.

The Star Alliance carrier is planning to take delivery of 32 more Airbus aircraft through to the end of fiscal year 2023, consisting of eight A320neos (joining three already in service), 21 A321neos and three A380s.

# Easier Connections with easyJet

Luton-based carrier easyJet claims to be offering "the first global airline connections service by a European low-fares airline". It has linked with long-haul services operated by Norwegian and WestJet following the launch of 'Worldwide by easyJet'.

It mirrors the traditional hub and spoke arrangements employed by legacy carriers, but replaces interline and codeshare agreements with "self-connect and sales partnerships through a digital, virtual hub which will offer the same sort of connectivity but more simply and efficiently."

Launched via the easyJet website on September 13, it is offered initially at London/Gatwick and takes advantage of the airport's existing GatwickConnects product, which enables passengers to check in their luggage at desks in the baggage reclaim hall without going landside. This, the carrier claims, allows customers to "seamlessly" connect their easyJet flight with long-haul services offered by its partners, Norwegian and WestJet.

The low-cost carrier also plans to replicate the concept at its other major hub airports, including Milan/Malpensa, Geneva, Amsterdam, Paris/Charles de Gaulle and Barcelona.

# End of the Line for PC-6

Production of the Pilatus multi-role PC-6 Porter will end in 2019. The Stans-based company has produced 500 examples in Switzerland since 1959 with nearly 100 built under licence in the US.

The aircraft is renowned for its short take-off and landing capabilities as well as its versatility.

Pilatus says it will continue to accept orders for the Porter until mid-2018, although it warned the number of available aircraft is limited. The company has also committed to providing support to existing customers for at least another 20 years.

The company is now focused on the introduction of the PC-24 Super Versatile Jet.

# Busy Start for flyadeal

"Phenomenal" seat sales have been reported by Saudi Arabian start-up flyadeal. The company took to the skies for the first time on September 23, the Saudi National Day, linking Jeddah with Riyadh.

Its debut came ten days after the low-cost carrier – part of the Saudi Arabian

Airlines group – was awarded its Air Operator Certificate by the Saudi General Authority of Civil Aviation.

Flyadeal has taken delivery of the first two of eight Airbus A320s it has acquired from Dubai Aerospace Enterprise. The jets, HZ-FAA (c/n 7829) and HZ-FAB (c/n 7867), were delivered

on August 23 and September 15 respectively. The carrier will first focus on domestic routes before expanding to regional services.

Con Korfiatis, the Chief Executive Officer of flyadeal, said: "Our seat sales have been phenomenal in the first few days and we're very excited about the future."

# A330-300s Begin Arriving for Shenzhen



The first of six Airbus A330-300s for Shenzhen Airlines arrives back at Toulouse/Blagnac airport on September 1 after having its livery applied at the Châteauroux paint shop. The aircraft, B-8865 (c/n 1810), was delivered to the carrier on September 24 and is part of an order for six that has been transferred from parent airline Air China's outstanding orderbook. Eurospot

# First ATR 72 Arrives at Eastern



**Two brand new ATR 72-600s based on Humberside will support the North Sea oil and gas industry.** Eastern Airways

Humberside-based Eastern Airways has received its first ATR 72-600 on lease from Nordic Aviation Capital. The new aircraft, G-IACY (c/n 1448), was handed over on September 8. A second airframe (c/n 1482) was due to follow imminently.

Eastern Airways said the 72-seat

turboprops will be used to support oil contract charter services between Aberdeen and Scatsta in the Shetland Isles.

Tony Burgess, Eastern Airways' Chief Operating Officer, said: "We are increasing our capabilities with the introduction of

these two brand-new ATR 72-600s into the fleet, which are ideally suited for the airports we fly to and environments we operate in. These efficient, modern aircraft help us to fulfil a vital role and provide a long-term commitment supporting the oil and gas industry."

## US Imposes Tariffs on C Series

The US has hit the Bombardier C Series airliner with two rounds of tariffs. An import duty of 219.63% was announced at the end of September, followed by an additional 79.82% on October 6. Both decisions may be overturned as the dispute comes to a final resolution early next year.

Boeing accused its Canadian rival of selling the aircraft below cost price,

alleging it had received state aid from Canada and Britain.

Boeing complained to the US authorities in April, claiming it had suffered financial harm after Georgia-based Delta Air Lines ordered 75 CS100s. The manufacturer said the deal was made possible because Bombardier received "extensive government support totalling more than \$3bn".

Bombardier says Boeing doesn't offer a rival product as it "abandoned" the 100-110 seat market "years ago", a point backed by Delta.

UK Prime Minister Theresa May said she was "bitterly disappointed" with the decision. Of the more than 4,000 people Bombardier employs at its plant in Belfast, where wings for the jet are produced, about 1,000 are connected to the C Series.

## Thomas Cook Strikes Off

Thomas Cook and the British Airline Pilots' Association (BALPA) have agreed to enter binding arbitration to end the dispute between the company and its pilots over pay. Strikes planned for October were called off. The pilots had held one 12-hour and one 24-hour strike in September.

## Emirates Add Capacity

Emirates will launch a fourth daily flight from Dubai to Sydney from March 25. The carrier announced the move after partner Qantas rerouted its Sydney to London service from Dubai to Singapore.

All four Emirates flights will be operated by the Airbus A380 – the new rotation providing a 7.3% increase in capacity on the carrier's Australian services.

## Jumbo Freighters for Qatar

The cargo division of Qatar Airways took delivery of its first 747-8F, A7-BGB (c/n 63199), at a handover ceremony at Boeing's Everett facility on September 25. It is the first of two freighters it has on order.

The Doha-based carrier also has four additional 777-300ERs to come, valuing the total deal at \$2.16bn, at list prices.

The aircraft were previously attributed to an unidentified customer in the manufacturer's orderbook. The second 747-8F is scheduled for delivery in November.

**Qatar Airways takes delivery of its first 747-8F.** Boeing





# THE NIGHT HUNTER – MI-28NE HELICOPTER

**A**t present Mi-28NE helicopters become more and more common. The main customers are foreign MOD. The Russian-made helicopters are traditionally of the greatest demand in the Middle East, in Africa, in Asia-Pacific region, in Latin America and in CIS countries.

The Mi-28NE conception from the date of its initiation and in the course of evolution has been improved greatly. It is commonly known that previously only pilot-in-command could operate Mi-28NE helicopter. At the same time it has been suggested to equip the front cabin with duplicated controls for a while.

Due to the dual control system pilot-operator or pilot-instructor can be the second crew member. As a result it significantly simplifies the training process of pilots and improves the aircraft survivability in threat environment.

The helicopter was designed as a special-purpose highly manoeuvrable rotary-wing attack aircraft intended to be “a flying platform for installation of various armament”. It was nicknamed a Night Hunter by the Russian troops thanks to its ability to perform combat missions at any time in simple and adverse weather conditions. The Mi-28NE is designed to conduct fire support of the forward land troops and to be deployed as a part of anti-mechanized defence, to destroy armoured vehicles, strike low flying and low-speed air targets, conduct

air reconnaissance as well as to provide target designation to helicopters and fixed-wing aircraft. The Night Hunter is heavily armoured and features high combat survivability.

In 2014 two months after the first supply there was a grand ceremony involving MOD of the first foreign customer where it was declared that the first three Mi-28NE helicopters had achieved the state of initial operational readiness. By that time the aircrafts had already been operated for defence against attacking militants. This military operation took place long before Mi-28NE helicopters were used by Russian Aerospace Forces in Syria during the operation to liberate Palmyra in 2016.

Foreign customers of a new Russian-made combat helicopter had to speedily enhance their own air forces to fight against numerous militia units and terrorist groups. Russian helicopters rapidly became an important component of the army aviation. From the very beginning of its operation the pilots have deployed all kinds of weapons of Mi-28NE helicopter including missiles and rockets, gun armament. Besides common S-8 type rockets the helicopters were often equipped with



*Photo - Eric Romanenko*

containers of more powerful S-13 type rockets of 122-mm calibre. Airborne gun mount of 30-mm calibre was regularly deployed in combat operations.

The routine missions of Mi-28NE helicopter were fire support during military operations in cities and pursuit of militants' armed pickup trucks and petrol tankers in the desert. But the helicopters were engaged in major combat operations as well.

Among most valuable advantages of Mi-28NE are not only all-weather and round-the-clock application capability but also a fire power. The military conflicts experience of the recent years has demonstrated that strike helicopters are mainly deployed in a close contact with the enemy.

The latest anti-terrorists operations have vividly demonstrated that the armed forces of many countries are in dire need of helicopters such as the Night Hunter – an up-to-date and highly-efficient aircraft possessing high manoeuvrability and great fire power.

The new capabilities of the Night Hunter have opened new perspectives in the world military market. The contracts on the supply of Mi-28NE helicopters with dual controls have been signed and are in the process of fulfilment.



*Photo - Roman Tregubov*

# Sundair Starts Ops



Sundair's A320 seen on departure at Palma de Mallorca Runway 06R on its way back to Kassel.

Javier Rodríguez

New German charter airline Sundair launched its first revenue flight on September 27 after its Air Operator Certificate (AOC) was granted the previous day. The initial service was flight SDR2402 Kassel to Palma de Mallorca with an A320 (D-ASEF, msn 4974).

Sundair is half owned by Schauinsland Reisen, a German tour operator that will celebrate its 100th anniversary in 2018, in collaboration with Spanish entrepreneur Marcos Roselló, CEO of Air41 technology company and founder of Sundair.

## IN BRIEF

A near century-old association between two Dutch firms was due to come to an end on October 28. KLM Cityhopper was to withdraw its last FOKKER 70, ending a 97-year link between the Amsterdam-based carrier and the Dutch manufacturer.

An Air Operator Certificate has been granted to Guernsey-based start-up, WAVES. The carrier intends to offer an air taxi service and cargo flights using a fleet of Cessna 208 Caravans.

A new base in Dublin is to be opened by NORWEGIAN. The low-cost carrier said the new hub, which will initially employ 40 pilots, will support Boeing 737 MAX-operated transatlantic services from Dublin, Cork, Shannon and Belfast.

An aircraft, crew, maintenance and insurance (ACMI) deal is being used by ATLAS AIR to operate a Boeing 747-400F for DHL Group Forwarding. The jet will fly between the US, Europe and Asia.

## Brussels Airlines Expands

Brussels Airlines' bid to acquire leisure carrier Thomas Cook Airlines Belgium (TCAB) has been approved by the Belgian government. The deal, which was given the go-ahead by the Belgian Competition Authority on September 12, firms up the proposal first announced in March under which Brussels Airlines will absorb 160 crew members, two aircraft and all the Thomas Cook subsidiary's slots at Brussels Airport. TCAB's three remaining aircraft will be redeployed across its parent group's other offshoots, while 40 ground personnel will be made redundant.

Brussels Airlines expects the deal, which builds on a 15-year partnership with the leisure group, to be completed by the end of October. It will make Brussels Airlines the leading airline partner of the Neckermann, Thomas Cook and Pegase tour operators.

## CIVIL ORDERS

Airline	Aircraft	Number	Order Placed	Notes
International Airlines Group	Airbus A330-200s	3	July 2017	
Mandarin Airlines	ATR 72-600	6	July 19, 2017	
Undisclosed	Airbus A350-1000	1	July 2017	
BOC Aviation	Boeing 737 MAX 10	10	August 2017	Deal finalised
Wizz Air	Airbus A321ceo	10	August 2017	
Frontier Airlines	Airbus A321neo	1	August 2017	
Private customer	Airbus ACJ319neo	1	August 2017	
Japan Investment Adviser	Boeing 737 MAX 8	10	August 2017	Finalised – commitment announced at Paris Air Show
Fiji Airways	Viking Air Twin Otter 400	4	August 2017	3 firm contract; 1 option
Cathy Pacific Group (for Cathay Dragon)	Airbus A321neo	32	September 2017	Order finalised
SkyWest	Embraer E-Jets	25	September 2017	15 will be E175 SCs and 10 E175s
Salah Air	RUAG Aerospace Do228NextGen	6	September 2017	MOU
Malaysia Airlines	Boeing 787-9 Dreamliner	8	September 2017	MOU
Malaysia Airlines	Boeing 737 MAX	8	September 2017	MOU
Japan Airlines	Boeing 787-8 Dreamliner	4	September 2017	
Turkish Airlines	Boeing 787 Dreamliner	up to 40	September 2017	Commitment
United Airlines	A350-900	45	September 2017	An existing order for 35 A350-1000s has been switched to this new order
Qatar Airways	747-8F	2	September 2017	
Qatar Airways	777-300ER	4	September 2017	
SpiceJet	Bombardier Dash 8-Q400	up to 50	September 2017	Launch customer
SkyWest	Embraer E-Jets	20	October 2017	15 will be E175 SCs and 5 E175s

## Austrian Bids Farewell to its Fokkers

The career of the Fokker 100 at Austrian Airlines is coming to an end. The final examples of the type are due to be out of service by the end of the year.

The company sold its entire fleet of Fokker aircraft, 15 of the 100s and six 70s, to Alliance Aviation Services of Australia.

The European carrier has replaced them with 17 Embraer 195s which it says consume about 18% less fuel per aircraft seat than the Fokkers.

The Embraer jets have an average age of four years and a seating capacity for 120 passengers.



The Fokker 100 is going out in style with this specially sign-written example pictured at Vienna. AirTeamImages.com/Chris Jilli





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# Naval Fighter Back in the Skies



**Hawker Sea Fury T.20 VX281 (G-RNHF) is now airworthy again.**  
Lee Howard via Navy Wings

Popular warbird, the Hawker Sea Fury T.20 VX281 (G-RNHF), returned to the skies at North Weald, Essex, on September 1. The Fly Navy Heritage Trust's aircraft was flown by Lt Cdr Chris Götke, who was awarded the Air Force Cross after skilfully landing the

Sea Fury at RNAS Culdrose Air Day in 2014 following an engine failure.

The T.20 is currently on loan to the Royal Navy Historic Flight and is displayed under an agreement between the Trust and the Royal Navy.

After the emergency landing at Culdrose, the Trust launched a £200,000 appeal to buy a new Bristol Centaurus 18 engine. The maintenance and repair work has been carried out by Weald Aviation. [www.navywings.org.uk](http://www.navywings.org.uk)

## Dutch Reproduction Floatplane Unveiled

More than 15 years' work came to fruition when volunteers from the Stichting Neptune Association unveiled their full-scale reproduction of a Van Berkel W-A floatplane.

The replica was placed on display at the Aviodrome museum in Lelystad, the

Netherlands, in August. Several original components have been incorporated into the project, which is painted to represent Van Berkel W67 of the Marine Luchtvaartdienst (Dutch Fleet Air Arm).

The W-A was a Dutch-built version of the

Great War-era Hansa-Brandenburg W.12. The latter served with the Imperial German Navy.

Thirty-five Dutch examples were produced from 1919, with the last of these being withdrawn from use in 1933. **Roger Soupart**

## Repaint for Vietnam F-4

Vietnam War veteran, McDonnell Douglas F-4D Phantom II 66-7550, which is being refurbished at the Aviation Heritage Park in Bowling Green, Kentucky, will soon be repainted. The jet was flown by Brig Gen Daniel Cherry in the war and shot down a Mikoyan-Gurevich MiG-21.

It was received by the park for static display in December 2005. **Tony Sacketos**

## US Canberra Restoration Finished



Refurbishment of Martin B-57B Canberra 52-1584 has been completed by the Kalamazoo Air Zoo in Portage, Michigan. The aircraft was built at Martin's Baltimore, Maryland facility, and delivered to the USAF on May 26, 1955. The exhibit is painted to represent a B-57B assigned to the 8th Tactical Bombardment Squadron during the Vietnam War. **Tony Sacketos**

## Museum Acquires Kiowa Helicopters

Three Bell/CAC 206B Kiowa helicopters from the Australian government's Defence Disposals and Sales department have been acquired by the Australian National Aviation Museum (ANAM) in Moorabbin, near Melbourne.

The ANAM tendered for the helicopters earlier this year and has been awarded

A17-006, which flew with both the Royal Australian Navy and the army, plus A17-045 and A17-055. The last two were constructed by CAC (Commonwealth Aircraft Corporation) and entered service in 1976 (A17-055 being the penultimate Kiowa to be built by the Melbourne-based company).

Based on the civilian Bell 206 JetRanger,

a total of 56 Kiowas were operated by Australian armed forces. The first 12 were built by Bell in the US, with the remainder produced by CAC.

The museum plans to restore A17-055 to static display condition and will place it alongside CAC Wirraway A20-10. With thanks to **David Soderstrom**



# Thunderbolt Flies Again

A Republic P-47 Thunderbolt, which was lost over Austria on the day World War Two in Europe ended, has flown again. The aircraft, 42-29150 *Dottie Mae*, ditched into a lake and sank on May 8, 1945.

Its remains were eventually recovered and the aircraft has been brought back to 'life' by Caldwell, Idaho-based Vintage Airframes.

Those involved with the recovery and restoration of *Dottie Mae* gave a presentation, prior to unveiling the fighter at Warhawk Air Museum's annual Warbird Roundup at Nampa, Idaho, on August 26.

The aircraft was then flown by John Maloney from California's Planes of Fame Air Museum. It made several further flights during the weekend.

The restoration has incorporated as many original parts as possible, with some replacement items used to finish the



John Maloney flying Republic P-47D Thunderbolt *Dottie Mae* over Nampa, Idaho on August 26. Frederick Johnsen

job. The original nose art panel was not suitable for use, but was put on display at Warbird Roundup.

The Vintage Airframes crew has accurately replicated all markings, even an apparent anomaly on the data panel

that lists it as a 'P47-D'. Now flying in the colours it wore during its wartime service with the 405th Fighter Group, it is believed to be the only surviving Thunderbolt that saw combat with the USAAF Ninth Air Force. **Frederick Johnsen**

## Short Stirling Found in North Sea

Memories of World War Two were revived when a wreck of what is widely believed to be a Short Stirling was discovered by engineers carrying out sea-bed surveys in the North Sea.

The bomber is thought to have been lost while transporting supplies to the Norwegian resistance.

The discovery was made by specialists working on the North Sea Link interconnector, a joint project being developed by Britain's National Grid and Norwegian electricity company Statnett, which will link the two countries via a sub-sea power cable, enabling them to trade electricity.

Historian Bengt Stangvik has been

recruited by the Norwegian Institute for Cultural Heritage Research to investigate the find in more detail. He said: "Several Stirlings disappeared without a trace on missions to Norway in the winter of 1944 to 1945. Based on the location of this wreck, it is probable that it was on a mission to drop supplies to the resistance forces in western Norway."

Thirty British aircraft went missing on similar supply missions to Norway, 19 of which were Stirlings. Bengt believes this discovery is likely to be one of the six currently unaccounted for. As the aircraft is almost certainly a war grave, it is covered by the UK's Protection of Military Remains Act 1986.

Sue Raftree of Britain's Joint Casualty and

Compassionate Centre – which co-ordinates investigations following the discovery of human remains of British service personnel – acknowledged the potential find. She said: "Discoveries at sea are relatively rare due to their location. A number of aircraft are known to have been lost in the North Sea during the course of the war but we need positive evidence before we can confirm. We would class this aircraft as a war grave. It is protected under the 1986 Act which covers crashed military aircraft in both UK territorial and international waters.

"There are many brave service personnel who have no known grave and who gave their lives fighting for their country." With thanks to **David Lavender - National Grid**

## Swallow Retains Irish Link



Irish heritage has been remembered by David Edwards with his restoration of BA Swallow L25C Mk.2 G-ADMF. The aircraft, pictured at Shobdon, Herefordshire, in mid-August, was built in 1935 and based in Ireland for many years. As a tribute to its previous owners, David plans to retain the Irish registration of EI-AFF in small lettering on the fuselage alongside a shamrock symbol. Paul Morton

## Record-Breaking Mustang

A new world speed record for a piston-engined propeller-driven aircraft was achieved on September 3 by renowned racing pilot Steve 'Steve-o' Hinton. He was flying a highly modified North American P-51D Mustang Voodoo to an average speed of 531.53mph (855.42kmh).

The Mustang is owned by Bob Button and was sponsored by Joe Clark and Aviation Partners of Seattle. The record was achieved from Clark's ranch in a remote part of central Idaho.

The previous benchmark was 528mph, attained by Lyle Shelton in modified Grumman F8F-2 Bearcat *Rare Bear* on August 21, 1989. Lyle's record had in any case been officially 'retired' due to rule changes and the replacement of an older timing system.

# YAM Unveils Mirage IVA

The sole Dassault Mirage IVA on public display outside of France is now on show at the Yorkshire Air Museum. The aircraft was officially unveiled on September 3 at a ceremony attended by Brigadier Général Laurent Lesellier, Deputy Chief of the French Air Force. Also present were representatives from other air forces attending the museum's annual Allied Air Forces Memorial Day. The jet was successfully transported to the attraction from France earlier this year.

The bomber, 45/BR, flew for the first time on May 6, 1966, in the hands of Elie Buge and Jean Cuny. It was delivered to the French Air Force on June 3 of that year, and went on to



The Yorkshire Air Museum unveiled its Dassault Mirage IVA on September 3. Courtesy YAM

complete 6,309 hours of flying. After being withdrawn from service, it made its last flight (and the final flight of any Mirage IVA) on September 11, 1991, landing at Châteaudun.

It was then exhibited at the Cité des

Sciences et de l'Industrie in Paris from March 1995 to January 2009 before returning to Châteaudun, from where it was finally delivered by road to Elvington. With thanks to **Ian Richardson**

## Did this C-47A Fly Over Arnhem?

A Douglas C-47A that may have taken part in the ill-fated Allies attack to breach the Rhine at Arnhem in World War Two is now being restored. The Swedish Air Force Museum is refurbishing Skytrain 42-93706 to static display condition at its base at Malmen, near Linköping.

Delivered to the USAAF on June 19, 1944, the aircraft was allocated to the 315 Troop Carrier Group in September of that year. It may have participated in Operation Market Garden (the airborne assault in the Netherlands) later that same month and the museum would welcome further information.

The aircraft was returned to the US after the war, and was modified by Canadair into

a DC-3A airliner. Registered LN-IAH, it then served with Det Norske Luftfartsselskap in Norway, and from 1948, with Scandinavian Airlines. After a further civil stint with Swedish airline Linjeflyg (as SE-CFR), it once again saw military service, flying with the Swedish Air Force as Tp 79 79007 from 1960.

With 30,920 flying hours 'on the clock', it was donated to the museum in 1982. The aircraft was kept in the open, due to a shortage of internal storage space, and the Nordic climate has taken a toll on its condition. Volunteers have recently cleaned and polished the Skytrain, and the ailerons and tail rudders are being restored with new fabric. **Lennart Berns**

## Two Avenger Projects

Two Grumman Avenger restoration initiatives have made significant progress in the USA. The Arizona Commemorative Air Force Museum (AZCAF), based at Mesa's Falcon Field near Phoenix, has acquired Grumman TBM-3E Avenger 53914 from the Quonset Air Museum at Rhode Island and aims to return it to airworthy status. Meanwhile, the DeLand Naval Air Station Museum in Florida has rolled out Grumman TBF-1 Avenger 01747, an aircraft that was lifted from Lake Michigan in 1991. The machine has been returned to the colours it wore in 1943.

**Roger Soupart**

## 'Doolittle' Japanese Raid Remembered

Work expected to cost \$150,000 (£116,000) and taking around a year to complete will be carried out on North American B-25D Mitchell 41-29784 *Furtile Turtle*. It is to be restored aboard the USS *Yorktown*, part of the Patriots Point Naval & Maritime Museum in Charleston Harbor,

South Carolina.

The aircraft will be repainted to represent a B-25B used in the famous 1942 Doolittle Raid on the Japanese mainland using 16 carrier-borne Mitchells. Aircraft 41-29784 was built in August 1942. [www.patriotspoint.org](http://www.patriotspoint.org)

## Reid and Sigrist Trainer Restored



Unique Reid and Sigrist R.S.4 VZ728 (G-AGOS) has been restored and is set to fly again. The work was carried out by Carl Tyers of Windmill Aviation at Spanhoe, Northamptonshire. The distinctive aircraft, previously based at the now defunct Snibston Discovery Museum in Leicestershire, completed a series of successful engine tests on August 26 and is likely to fly in the near future. **Mick Bajcar**

### IN BRIEF

On August 20 at the Aviodrome museum in Lelystad the right engine of a former Marine Luchtvaartdienst (Dutch Fleet Air Arm) Grumman S2F TRACKER V151 was powered up and its wings were folded several times. Its other engine is sadly beyond repair, but a new unit has been acquired and will be fitted in due course. The aircraft has been under restoration for several years. **Roger Soupart**

A reproduction of the unique LAMBACH HL.II biplane is to be restored to airworthy status by Stichting Vroege Vogels at Lelystad in the Netherlands. The machine, PH-APZ, was built by students from the Delft University in the 1990s to represent the aircraft designed by Dutch engineer Hugo Lambach, which first flew in May 1937. **Stefan Schmoll**

PIAGGIO P.149 D-EHVO has been acquired by Simon Kopmann. It will be based at Diepholz in Germany. Prior to its arrival in August it was repainted at Lodz in Poland and now represents JA+391 of the Luftwaffe's JG 71. The unit flew a few Piaggios from Ahlhorn in the 1960s. **Patrick Dirksen**



# UAC MAKING STEPS IN CORPORATE RESTRUCTURING

The United Aircraft Corporation (UAC) was founded in 2006 to develop Russia's advanced aviation programs. UAC combines nearly 30 enterprises to be one of the largest players of the global aircraft industry. The Corporation unites such famous brands as Su, MiG, Il, Tu, Yak and Beriev, as well as the new SSJ100 and MC-21 being able to design, produce and deliver to the market an ever-growing number of world class aircraft.



*Sukhoi Superjet 100 is in serial production at the UAC facilities in Komsomolsk-on-Amur*

In early September meetings of Boards of Directors of UAC, Irkut Corporation and Sukhoi Civil Aircraft were held. A number of decisions of these governing bodies give a start to transformation of UAC, Irkut Corporation and Sukhoi Civil Aircraft into a new Corporate center of a single united company with functions of a Civil Aviation Division. This is an

important step within the corporate transformation program to form a single company in accordance with previous decisions of the UAC's Board of Directors.

All existing and perspective aviation programs remain on track in full as well as all contractual obligations. All employees including engineers and workers remain committed to creating competitive Russian aircraft.

In accordance with decisions taken UAC President Yuri Slyusar while retaining his current post for the duration of transformation will become President of Irkut Corporation. Oleg Demchenko, who for many years successfully managed Irkut Corporation will become First Vice President – Chief Designer of Irkut Corporation.

Corporate transformations are aimed to realize UAC's strategic goal to increase the share of civil products in its portfolio to 45% by 2035 and to drive annual civil aircraft production to 100-120 aircraft per year, as well as to increase UAC's economic effectiveness and lower costs by centralizing supporting processes and decreasing levels of management.

The formation of the "transformation core" – UAC's new Corporate center will allow to increase effectiveness and expedite the changes including the formation of the military, transport

and special purpose aviation divisions.

The estimated effect from reduced costs in vendor items procurement, optimization of loan-based and investment funding, reduction of debt management costs and other factors will provide a substantial effect and increase sales profitability. The changes aimed at achieving a more competitive market position are widespread in the world's aerospace industry.



*Yuri Slyusar, UAC President in front of Su-30MKI of IAF*

*"We are close to a situation where any project should involve all parts of the mechanism and the old structure is becoming less and less adequate to new challenges. We are not competing inside the country, as previously, we are competing globally with global players. Without solidarity there is no competitiveness. The single united company should become the vehicle that will help to achieve the necessary competitiveness level. In this logic we are bringing UAC's corporate landscape to the target model." - Mr. Slyusar*



*MC-21 has been successfully passing flight trials*



# BELFAST INTERNATIONAL AIRPORT CONTINUED GROWTH

**Guy Warner** outlines Belfast International Airport's growth through the decades.



**T**wo airports serve Northern Ireland's biggest city with Belfast International Airport (BIA) about 30 minutes away by road while George Best Belfast City Airport is just 3 miles (5km) from the city centre.

Belfast International still benefits hugely from the mixed military and civilian use it has had for much of its life. It has two runways: 07/25, which is CAT IIIb, and 9,120ft (2,780m) in length and 17/35, while the CAT I crosswind runway is 6,204ft (1,891m) long. It means the airport can accept the largest aircraft. Managing Director Graham Keddie stressed the importance of traffic using the North Atlantic route: "It is vitally important that we are equipped to handle aircraft arrivals and departures without restrictions 24 hours a day, 364 days a year; though we would open on Christmas Day if requested."

He is proud of how business has developed in the three years since he became MD – 24 consecutive months of double-digit passenger growth and 30 months of expansion.

PR and Marketing Manager, Deborah Harris, said: "Graham has given us a new confidence in ourselves, that we can deliver, and to be proactive with our customers (airlines and passengers) with what we have to offer. We now have nearly six million passengers per year."

## NEW ROUTES

Work is always going on to identify further sustainable routes within what is a relatively small market. Success depends on finding destinations to which the two million or so potential commercial and local leisure customers would find of interest, and on Northern Ireland being seen as an attractive destination for incoming tourists and business traffic.

By maintaining a constructive partnership with the airlines, tour operators and in-terminal retailers, the aim is to continuously develop and enhance the experience of departing and arriving passengers. The airport strives to maintain an efficient, stress-

free passenger flow, despite the increased mandatory security demands of recent years. Attention has been given to the infrastructure to ensure travellers have a positive first impression of Northern Ireland.

Helping to achieve this aim is understanding how critical the performance of retail outlets is to the profitability of any modern airport. One example of a commercial initiative at Belfast International, which has had a positive benefit for passengers, is the introduction of significant cost savings when using the BCP long-stay car park if it is pre-booked via the internet.

Low-cost flying has been an important driver for increasing passenger numbers using the city's two airports. The public has benefited from the cheaper air fares offered by such carriers.

The Routes Europe conference held in Belfast in April this year was a showcase for the region, enhancing perceptions of Northern Ireland as a leisure destination. It also brought the public relations and





Main photo: **Ryanair** began services from **Belfast International Airport** in **March 2016** and is currently flying to **14 destinations**. Jim McGann

Top: **Built by Harland and Wolff** in **Belfast**, a **Handley Page V/1500** heavy bomber emerges from the assembly hangar at **Aldergrove**. Harland and Wolff

Above: **The Avro 618 Ten, G-ACGF**, of **Midland & Scottish Air Ferries** which was used on the first sustained scheduled services from **Aldergrove** in **1933**. AJ Jackson Collection

Below: **An aerial view of Aldergrove** in **1940**. The location of today's civil terminal is towards the top right, adjacent to the further of the two runways going from left to right. Author's Collection

marketing staff from both Belfast airports together in a common cause.

They have a big rival. **Dublin Airport (DUB)** is less than 100 miles (161km) south and there are good surface links between the two capital cities. It also offers a range of destinations, which neither of the Belfast airports presently matches, and it is not hampered by the UK-imposed Air Passenger Duty (APD). A publicity campaign by BIA seeking to attract passengers from the Irish Republic's (ROI) border counties generated considerable media exposure.

The airport's Business Development Director, **Uel Hoey**, who has been at BIA for nearly 30 years, said: "We are seeing a very notable increase in the number of passengers from the ROI. A favourable £/euro exchange rate is boosting cross-border traffic. It is busier than ever before at BIA and our retail, catering, security and operational partners have taken on extra staff to cope with the demand."

He added: "The greatest boost to steady and sustainable growth we could have ▶







Left: **Consolidated Liberator Mk IIIs of 120 Squadron at Aldergrove; one of the very long range types so important in winning the Battle of the Atlantic during World War Two.** RAF Aldergrove



Below left: **Trident Two, G-AVFI, at Aldergrove. The type was a familiar sight at the airport from 1967 to 1985. A Trident holds the record for the fastest stand-to-stand time between London and Belfast of 41 minutes.** John Barnett

would be the removal of APD, which adds £13 per journey to anywhere in Europe as far as Cyprus, and £26 to a domestic return."

He is delighted by the way Ryanair has encouraged visitors from Italy and Germany, and is hopeful of expansion in Eastern Europe and Scandinavia.

## CARGO

Freight and mail services are significant with 50,000 tonnes a year being handled by West Atlantic, DHL, UPS, FedEx/TNT and Swift Air which operate nightly schedules from the dedicated cargo terminal to London Luton and Stansted as well as East Midlands with Airbus A300, Boeing 737, 767 and Embraer Brasilia freighters.

Mr Hoey noted: "BIA is the only viable option for airmail and air cargo in Northern Ireland. We occupy an important niche market with regard to high value/low volume or time sensitive items and float like a cork in the economic wind at a fairly steady state." Belfast City Airport is not open 24 hours so is less attractive to freight operators.

For much of the last century, Aldergrove was a key RAF air base, particularly during World War Two. The military footprint was tiny by 1968 but began to expand rapidly with the onset of 'The Troubles'. One of the effects of the ensuing 30 years of civil disorder was the dampener that it put on the local tourist industry and thereby civil air transport.

The airfield acted as an airhead for flying troops in and out and was also the military's major operational tactical base. Eventually it was home to the helicopters of 72 and 230 Squadrons, 5 Regiment Army Air Corps, and numerous Fleet Air Arm detachments over the 38 years of Operation Banner, which was the British armed forces' longest continuous deployment in its history as it supported the Royal Ulster Constabulary.

The RAF ensign was lowered on September 20, 2009 to mark the end of Aldergrove as an air force base. Not long after the Pumas of 230 Sqn departed for the last time to their new home at Benson in Oxfordshire.

Military aviation has remained in the

Above left: **A pair of Pumas from 230 Squadron over Aldergrove in December 1972 led by a Wessex from 72 Squadron.** Guy Warner Collection



Left: **British Midland DC-9-15, G-BMAA, at Belfast International in the mid-1980s. BM's Diamond Service provided competition for BA's Super Shuttle on the London Heathrow route.** via Norman Lindsay



shape of the Gazelles, Islanders and Defenders of 5 Regiment Army Air Corps.

Another continuing presence is the Police Service of Northern Ireland (PSNI) Air Support Unit (ASU), with fixed-wing and rotary assets.

## THE EARLY DAYS

Aldergrove was one of three sites in Ireland selected in 1917 by Major Sholto Douglas, a senior Royal Flying Corps officer, as potential airfields; the others were Collinstown, now Dublin Airport, and Baldonnel, southwest of Dublin, which is still the headquarters of the Irish Air Corps.

The Northern Ireland site was used the following year for testing the first British four-engine heavy bomber, the Handley Page V/1500, constructed in Belfast by Harland and Wolff. In the troubled early years after World War One, it became the main Royal Air Force base in Ireland and the home of the first Special Reserve unit, 502 (Ulster) Squadron.

A few experimental civil air services used the facilities in the 1920s, with pioneering English aviator Sir Alan Cobham a regular visitor.

It was not until May 31, 1933 that the first sustained airline route from Aldergrove was inaugurated by Midland & Scottish Air Ferries from Glasgow, Renfrew via Campbeltown. On August 20 the following year, the pre-eminent internal airline of the day, Railway Air Services, began operating from Croydon to Aldergrove by way of Birmingham and Manchester.

A new, purpose-built civil aerodrome, Ards Airport opened in the same year and by 1936 all civil airline services had transferred there. It was superseded by Belfast Harbour Airport in 1938, which itself was replaced by Nutts Corner, near Crumlin, in 1946. Belfast Harbour Airport reopened in 1983 as Belfast City Airport.

During World War Two, Aldergrove had played an important role as a fighter station for the defence of Belfast, an RAF Coastal Command base and the home of 23 Maintenance Unit. After the war, the main military activities were the meteorological squadron flying weather sorties far out into the Atlantic, the re-formed 502 Sqn (latterly flying Meteors and Vampires by the time it was disbanded in 1957), Coastal Command Shackletons, test-flying for Short and

**The airport can handle the largest aircraft, such as the mighty Antonov An-124.**

Jim McGann



**The nightly freight and mail services have always been, and remain, a highly important part of Belfast International's operations.** Jim McGann



**An overview of the entrance at Belfast International, completed in 2009.** Belfast International Airport

Harland, and as the starting point for record-breaking transatlantic jet flights.

Later came Army Air Corps helicopters and support to the police from the RAF's 118 Sqn Sycamore helicopters during the IRA's 'Border War', which ended in 1962.

## NEW TERMINAL

Airline services from Aldergrove had ceased in 1936, when the airfield reverted to purely military use. However, in 1963 a new, architecturally striking terminal was opened at Aldergrove, on the opposite side of the airfield to the military base, with which it would share the site. The first services into the new airport transferred from Nutts Corner on the night of September 26/27.

All the British airlines serving Northern Ireland in the 1960s have now vanished. Some merged with others, some went out of business. Their names are evocative of a bygone age, the distinctive liveries but a

memory: BEA, Cambrian Airways, BKS Air Transport, British Eagle, Derby Airways and British United Airways. The latter introduced jet aircraft on the service to London Gatwick using BAC One-Elevens in January 1966. BEA responded with DH Comet 4Bs to Heathrow as an interim measure until the advent of the DH Trident 1C in early 1967.

In 1968 BOAC, with Vickers VC10s, and Aer Lingus using Boeing 707s, began scheduled operations to New York via Prestwick and Shannon respectively.

The mid-1970s saw the arrival of widebodied jets, including the Lockheed L-1011 TriStar on the Heathrow service. Later in the decade British Airways introduced its 'Shuttle' (a frequent, walk-up service). In the 1980s a great rivalry developed between BA's Super Shuttle and British Midland's Diamond Service on the crucial and lucrative London route. British Airways pulled out of BIA in 2001 though ▶





## GA BUSINESS

General aviation traffic at BIA is in the hands of three operators: Woodgate Aviation, which was founded in 1969; Jet Assist, which has been present since 2014; and Global Trek Aviation from 2015.

Woodgate Aviation has two Beechcraft King Airs and four Piper PA-31s. It carries out air ambulance transfers, air ambulance ground handling, private charter work, aerial photography and aircraft maintenance. A new state-of-the-art hangar on the demarcated ramp, incorporating a reception and maintenance base, was opened last year. It supports the company's aircraft charter, private jet sales and management, maintenance and Fixed Based Operator (FBO)/VIP private jet handling services.

Jet Assist runs the Executive Business Jet Centre which is the only facility on the airport and in Ireland to have a dedicated security checkpoint on the premises for corporate aircraft. UK rules require aircraft that are over 10 tons flying commercially need to have the passengers and baggage security screened with the same applying to private aircraft over 45 tons (military aircraft are exempt). The company has been responsible for generating a significant increase in VIP aircraft movements and in the size of business jets visiting, including aircraft as large as a corporate A340. It offers brokerage of business jets for charter and handles visiting tech stop, private and chartered aircraft. The company also can provide brokerage facilities for selling and buying aircraft.

Global Trek Aviation is a FBO which set up a dedicated, purpose-built Executive Jet Centre in April 2015 and has also been instrumental for generating huge growth in the non-schedule aviation activity. Managing Director David McColm commented: "BIA has a fantastic strategic location for transatlantic flights requiring a stop for fuel or technical crew purposes."

returned to Northern Ireland in 2012 with a Heathrow service to Belfast City Airport.

The airport was renamed Belfast International in 1983 and, despite the challenge of commercial schedules being operated from Belfast Harbour Airport, now George Best Belfast City Airport, passenger

Right: **Norwegian began services to Stewart International in upstate New York, and Providence, Rhode Island from July 1 this year.** Jim McGann

Below: **En route technical stopovers by US military aircraft – here a USAF Boeing KC-135R Stratotanker – have been a fairly common sight in recent times at Belfast International.** Jim McGann

numbers passed two million a year for the first time in 1987.

A series of infrastructure projects were completed in the 1990s. A new cargo centre opened in 1991 and two years later an airport hotel was built.

Charter services to a wide range of destinations in Europe and North America also continued to prosper, with a total of more than 500,000 passengers in 1993.

Ownership was changed by a management buy-out from the government in 1994 and again when the TBI Group, a property company, took control in 1996.

The years following the 9/11 terrorist attacks in 2001 were tough for the whole airline industry. Belfast International had to cope with the loss of blue-chip carriers, British Airways and British Midland, as well as Aer Lingus, British Regional and Sabena.

That shock to the business was eased by the advent of low-cost carriers easyJet and Go, which would be followed by bmibaby in 2002, and Jet2 in 2005. A wide range of destinations in the UK and Europe were offered.

A major development came on May 27, 2005 with the departure of a Boeing 757 of Continental Airlines to Newark, the airport's first non-stop scheduled service to the USA.

The airport's ownership changed the same year when it was bought by Abertis, a Spanish infrastructure conglomerate. Passenger numbers grew substantially, approaching five million by the end of that year.

BIA also has what has become quite a rarity at airports – a public viewing gallery. This is in the terminal building and overlooks the main apron. Graham Keddle insisted on reopening it when he became MD

Manx2 and Flyglobespan arrived in 2006, while Aer Lingus restarted flights from the airport in 2008, with a range of routes

including the restoration of a Heathrow service. However, it moved its operations to Belfast City Airport in 2012. There is currently no link to Heathrow from BIA. The collapse of Flyglobespan in December 2009 resulted in the cessation of services to Canada and Florida.

The original terminal from 1963 is still at the core of the airport, but over the years has been subject to much reconfiguration, additional structures and upgrading. In the latest developments, central security/search was relocated to the departures concourse, a two-storied, glazed facade was built at the front of the terminal accommodating lifts, stairs and escalators to reach the departures concourse, and a duty-free area redesign created space for more than 20 shopping and food outlets.

The global recession, which began in 2008, caused a dip in annual passenger numbers to around 4m but figures began to rise again in 2015 due to expansion by Jet2, easyJet and Thomas Cook, and the arrival of Ryanair in March 2016.

In January this year, United Airlines ceased the service to Newark but has been replaced by Norwegian flying to Stewart International in upstate New York and Providence, Rhode Island, from July 1.

Virgin Atlantic flew a short schedule of summer services with a Boeing 747 to Orlando, which will be significantly increased next year.

Belfast International Airport continues to work with all its partners to grow the business and help stimulate economic growth in Northern Ireland. At the same time, it strives to act as a socially responsible member of the community, around the airport and across the nation. The ongoing growth in passenger numbers shows the potential for the airport going forward. **AN**





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# FLYING THE JAVELIN

**Tom Docherty** tells the Javelin's story through the eyes of men who operated the interceptor during its RAF service.

**E**ntry into service for the RAF's first all-weather fighter was a long, slow process after the Gloster Aircraft Company was awarded a contract in 1948 to build five of its G.A.5 jets to Air Ministry specifications. Changes to the order delayed the whole project and the first prototype flew on November 26, 1951.

It was not until July 22, 1954 that the initial production aircraft, now known as the Javelin FAW.1 (Fighter All Weather), took to the air. The type developed through several different marks (see panel on p29).

The FAW.1 went into service with the RAF in February 1956 when 46 Squadron began intensive flying trials at RAF Odiham,

Hampshire. Initial training was carried out with the introduction of two pilots to the type at Boscombe Down, Wiltshire, who helped convert the rest of the squadron's aircrews.

The training system used by 46 Sqn was thought to be less than ideal for such a complex aircraft and 228 OCU (Operational







Conversion Unit), formed in January 1956 initially with the Javelin FAW.5.

The switchover was, however, not happening fast enough and a Javelin Mobile Training Unit (JMTU – also known as JMCU) formed in 1957, comprising two pilot instructors, two navigator instructors, 16 ground crew and two Valetta pilots. One Valetta was used for transport and the other as a flying classroom with an AI Mk 17 radar in nose.

The JMTU travelled from airfield to airfield converting Meteor and Venom squadrons without the need to detach aircrew to the OCU.

### EXTRA FUEL

Geoff Moores had previously served as a navigator on the Meteor NF.11 with 264 and 87 Squadrons before becoming a Javelin navigator instructor at 228 OCU at RAF Leeming, North Yorkshire. He recalled the FAW.5, and the training regime both there and with the JMTU. "On the Mk 5, the significant advantage was the extra fuel capacity," he said. "The extra airborne time this gave crews undergoing conversion on type allowed more to be crammed into each sortie – and a safety margin, given the claggy weather we could experience around the Vale of York in the 1950s."



Main photo: **Javelin FAW.9R XH896/Q of 64 Sqn.** The 'R' signified it was able to be fitted with an air-to-air refuelling probe, though it wasn't always carried. Key Collection

Far left: **A line up of 46 Sqn Javelin FAW.1s at RAF Odiham.** This squadron was the first to be equipped with the type in February 1956. Key Collection

Left: **A Javelin FAW.4 showing off the distinctive delta planform of the wing and the 'pen nib' jet exhaust.** Key Collection

Below: **A 23 Sqn Javelin FAW.4 during a typically smoky engine start.** Key Collection





A formation of Javelin FAW.2s of 46 Sqn, with amended unit markings from when the unit first operated the type. Key Collection



"New pilots easily converted to the Javelin and found its handling characteristics to their taste. On both the JMTU and the OCU, the ground school was very thorough, so new crews had a good knowledge of the aircraft systems before their first sortie. There was a comprehensive quiz/questionnaire and the required pass mark was 100%."

As the nav/rad leader (senior nav/rad on one of the three training squadrons at the OCU), Geoff said he never had any qualms about flying with a pilot who was on his first trip on the Mk 5.

"These were usually experienced pilots on their way to command Javelin stations and squadrons, rather than first-tour pilots. Sometimes they were day-fighter pilots, off

Venoms and Hunters, for whom flying with a navigator was a novel experience."

Newly qualified navigators training as nav/rads probably had the more difficult task. There was no sure way, Geoff said, of judging their aptitude for a complicated task.

It required the nav/rad to simultaneously manipulate the radar controls, obtain a

Servicing being carried out on Javelin FAW.9R XH879 of Sixty Squadron at RAF Tengah. The aircraft also served with 64 Sqn. TGD Collection



A Javelin FAW.5 clearly showing the cannon ports in the wing. Key Collection







**Javelin FAW.9 XH898/GHB** – the personal aircraft of 228 Operational Conversion Unit's Officer Commanding, Wg Cdr GH Beaton. Having undergone maintenance and been stripped for repainting, an urgent request for an aircraft led to it being despatched in bare metal. Adrian M Balch Collection

lock on the target as early as possible and work out the pattern of the intercept to bring the pilot into a position to gain a visual, at night, or into a gun firing position, by day. The OCU at this time did not have missile-equipped Javelins so training was not done on the Firestreak by the unit.

At the same time they had to provide a running commentary to describe the target's relative position – "so the pilot wouldn't worry too much" – interspersed with instructions to get to the required position without too much delay.

"Life got even more interesting if the target started to evade, especially if one hadn't managed to get locked on first," said Geoff.

"Once locked on, the pilot had the advantage of a 'collimator', a small repeat display of a fairly restricted part of the nav/rad's C-scope display (ie, no range information).

"Provided he didn't let the target get too far from the centreline, a skilled pilot could follow – ie, chase – an evading target very effectively. As I remember, we only rarely practised it. Perhaps our pilots felt we

needed the practice more than they did."

The AI.17 radar had severe limitations for that era, Geoff said, and was susceptible to jamming. "For a successful intercept of the primary threat to the UK at that time – a high-level but subsonic bomber – one was heavily reliant on good ground control to set up the initial intercept parameters.

"The maximum pick-up range of the AI.17 head-on against a fairly large target, such as the equivalent of the Soviet *Badger*, might then allow the nav/rad to turn in line astern for the pilot to obtain a visual," ▶

## DEVELOPING THE JAVELIN

The FAW.1 to FAW.6 marks were powered by two Sapphire SA.6 turbojets, each with 8,000lb static thrust (lb st), and armed with four 30mm Aden cannon positioned in the wings.

Later marks, the FAW.7, FAW.8 and FAW.9/9R, had more powerful Sapphire SA.7 and SA.7R engines and, while retaining the cannon, carried four Firestreak air-to-air missiles.

The non-afterburning SA.7 Sapphire provided 11,000lb st for the FAW.7, while the SA.7R on the FAW.8, 9 and 9R produced the same but with reheat this increased to 12,300lb st.

All were radar-equipped except the T.3 trainer version, which was distinguishable by its extended and more pointed nose profile, all-moving tailplane and bulged cockpit canopy for a better forward view

for the rear-seat instructor.

The FAW.1 was equipped with British AI.17 radar while the FAW.2 had an American APQ43 radar in a redesigned shorter nose radome.

The FAW.2 was in turn developed into the FAW.6 (still with the short nose and US radar) by redesigning the wing interior to make room for more fuel and incorporating pylons for the Firestreak. The British radar-equipped FAW.4 was developed in the same way to become the FAW.5. In the end, neither the FAW.5 nor 6 carried the missiles.

The FAW.7, the first Javelin to carry the Firestreak, was developed from the FAW.5 by having a powered rudder and an extended rear fuselage (losing the 'pen nib' profile of previous marks) to accommodate the Sapphire SA.7 engines.

By the time the FAW.7 entered service, development of the type was moving so quickly that many went straight into storage owing to the introduction of the reheat-equipped FAW.8. The stored FAW.7s were eventually converted to FAW.9 standard.

The FAW.9R was equipped with a large refuelling probe extending well forward of the nose (which wasn't always carried).

The introduction of reheat in the FAW.8, 9 and 9R did little to improve the jets' capabilities as afterburner could only be used effectively at high altitude. A constant-rate pump could only provide sufficient excess fuel at high altitude to supply the reheat burners without causing a loss of thrust from the engines.

**Javelin FAW.9 XH725/P of Sixty Squadron** passes a junk at low level off Singapore. G Moores







he explained. "This was essential in order to engage the target with the four 30mm cannon. These would have been very effective at the correct range, if the *Badger* rear gunner didn't get you first.

"The Javelin's guns were mounted in the wings and had to be harmonised at a range ahead of the aircraft so that the fire of all four would be concentrated at that point."

### PILOT'S VIEW

Fred Butcher, who served as a pilot with 23 Sqn in 1957/58, recalled the handling qualities of the Javelin – and taking part in a very special flypast. "The flying characteristics were superb. It was a very stable platform, and responded very well to all demands," he said. "It was very easy to fly and, although a large and heavy aircraft, it was a real fighter and very manoeuvrable. There were no real dangers to flying the Javelin as such – with two provisos. There was no normal way of recovering from a stall; you had to go into a spin first. This meant that if you stalled below 15,000ft it called for ejection.

"However, in 1,200 hours I never ever got close to stalling, though there were several accidents caused by this phenomenon.

"The other was more an engine problem, called centreline closure. In certain meteorological conditions [such as] supercooled water droplets, the compressor casing would shrink on to the turbine blades, which could be catastrophic.

"This was cured by coating the compressor casing with a Rockside A4

ceramic abrasive so that it would wear down the blades. It seemed to work, albeit with a small loss of power."

The cockpit, said Fred, was easily the best designed of all the aircraft he'd flown up to that point, "and there were quite a few."

The best thing about the jet was its handling and it did what it was designed for very well, Fred noting: "It was very effective in the FAW role, though more so with the Firestreak missiles."

Three Javelin squadrons were detached to RAF Tangmere, West Sussex, for a flypast at the 1957 Farnborough Airshow. Fred explained: "The first nine Javs on the runway were 46 Sqn, the second nine were 23 Sqn and the third nine 141 Sqn. We would overfly Farnborough every day as part of the display.

"I was deputy leader of 23 Sqn, but on the last day the leader decided he would like to see it from the ground, so I found myself leading the squadron as a mere flight lieutenant. It was a big day for me and, not only that, Wg Cdr Harry White, who led the whole thing, decided we would use the reserves to make up the formation from 27 aircraft to 36.

### FAR EAST

Geoff Moores arrived on Sixty Squadron (never written as '60' by squadron members) at RAF Tengah in Singapore in 1965 after a long period instructing at 228 OCU, and teamed up with the Officer Commanding, Wg Cdr Mike Miller AFC, whom he had known for many years.

Sixty were flying the FAW.9 and Geoff found this mark a quantum leap from the FAW.5 he had flown in previously. "I was the NRL [nav/rad leader] in 1965 when Mike arrived later in the year and we began flying regularly together. His experience on the aircraft was unparalleled, and the crews on Sixty were also very experienced, but I couldn't say the same of my own position. I was still very much learning on the Mk 9, after my previous tour as an instructor on the Mk 5 at 228 OCU, Leeming."

Finding it was effectively a different generation from earlier marks, Geoff thought this seeming handicap was an advantage as he learned as he flew, "perhaps taking a fresh look at the aircraft. Despite knowing the Javelin's days were numbered, I knew there was still more we could discover about its capabilities, and this was one of Mike's key attributes as CO and as the pilot I would normally fly with.

"It made the rest of my tour, until I left in June 1967, the time of my life as far as my RAF flying career was concerned."

Geoff was aware of the technical problems with the Sapphire engines – especially when the Javelin was permanently stationed in the tropics – and the peacetime handling limitations because of the problems recovering from a stall.

The secret was not to get into that unhappy situation, he said, believing experienced Javelin pilots were fully capable of effectively operating the aircraft.

The two Javelin squadrons in the Far East, Sixty and 64, operated Firestreak-



A 228 Operational Conversion Unit Javelin T.3 at its home base, RAF Leuchars, in July 1966. Aircraft XH397 also served with 41 Sqn and was scrapped by 27 Maintenance Unit at RAF Shawbury on March 21, 1968. Adrian M Balch Collection





**A 29 Sqn Javelin FAW.9 XH712/K at RAF Sharjah in 1966. Originally an FAW.7, it was converted to FAW.9 and, later, FAW.9R standard serving with 23 Sqn at RAF Tengah, coded 'V'. The Aviation Photo Company**

equipped FAW.9s and 9Rs ('R' indicating in-flight refuelling capability). Though the Firestreak missile had been in use in the European environment, it was relatively new to the conditions encountered in Malaysia. Consequently, Geoff Moores was heavily involved in the evolution of trials and tactics for its use.

"What we were faced with in the Far East at that time was very different," he said. "The Indonesian 'confrontation' with Malaysia was a fairly low level of conflict, in two senses of the word. On the ground there was a nasty little war in Malaysia proper, but especially in Borneo.

"When I arrived on Sixty, there'd been significant changes in that there was now a second Javelin squadron, No.64, and the task which Sixty had fulfilled on its own was now divided between the two.

"Sixty took on most of the air defence role at Tengah, with a detached flight at RAAF Butterworth [near Penang in Malaysia], and 64 Sqn took over the Borneo detachments, while assisting in the air defence role at Tengah.

"One can see that this made operational good sense, with 64 taking over the longer-range Mk 9R for their low-level patrols of the border between Malaysian Borneo and Indonesian Borneo.

"There was the world of difference when I joined Sixty after five or six years away from the Javelin on ground tours. Same old Al.17 but much more like a modern weapons system.

"I had to get to know the Firestreak AAM because the first practice firing in the Far East was a resounding failure. Wg Cdr Jock Fraser was still the CO and I went with him to RAAF Butterworth to fire it against a ground-to-air rocket the Aussies used as a target for their Sidewinders.

"Unfortunately, Firestreak didn't like it as much. The missile left the pylon with a bang [it was held in place by a bolt until the thrust from the motor was sufficient to shear it] but then nosedived into the sea.

"Firestreak would not launch unless the infrared was acquired, but if lock-on to the infrared source was then broken, the missile could go anywhere – which it did on this occasion.

"So, Jock Fraser and I returned to Tengah the same day, somewhat silent and lost for thought. But it did mean I had reason to delve into the missile's mysteries more deeply than I might otherwise have done."

Geoff discovered the trouble with that first firing seemed to originate in the difference between the Sidewinder and Firestreak. "In my recollection, we found that the two missiles used different parts of the infrared spectrum."

The solution came, he said, when it was suggested, probably by the senior engineering officer, that a parachute flare be deployed from a Canberra of 45 Sqn, also based at Tengah.

"This was, of course, essentially a

stationary but slowly descending target, so I had to work out a profile for the releasing Canberra and the firing Javelin that would allow the [former] to get well clear of the danger zone before it was fired. As further reassurance for the Canberra crews, I did fly with them on one of the sorties.

"After that, there were no further problems with Firestreak in my time on Sixty and I had a great respect for its capabilities outside the environment envisaged in its original specification."

## AIR DEFENCE

Air defence of Singapore, the key task at Tengah, posed a difficult tactical problem. There was, Geoff said, a very restricted early warning for anything coming from Indonesia and an ever-present risk of straying into Indonesian airspace.

"The nature of the threat we had to train for was quite varied. The Indonesian Air Force was equipped with the Soviet *Badger*, so we had to be prepared for the sort of high-level interception known in the UK environment. But it was part of our routine training to practise interceptions at medium to high level.

"Then there were the Indonesian transport aircraft known to parachute armed parties into Malaysia at night; using the Hercules, as I recall. So, interceptions of multi-engined but fairly slow targets at a moderate low altitude also had to be practised. ▶

**Javelin FAW.9 XH834/PDW flown by the Officer Commanding 64 Sqn, Wg Cdr P D Wright, over Singapore in June 1966. Adrian M Balch Collection**





"Mike Miller and I were always ready to take advantage of RAF and civil aircraft going about their legitimate business as unwitting targets for practice interceptions. We were particularly interested to see if Firestreak would be effective against turboprop targets; ie, anything analogous to the Hercules.

"We would spend quite some time behind any such target, like the occasional Argosy or Britannia, trying to work out how to give the missile the best chance of acquiring on the IR from the exhausts of the Hercules.

"We concluded that a slight angle off, to give sight of the exhausts, might do the trick. Certainly, we could get an acquisition with the practice rounds we usually carried; ie, no motor or warhead.

"Once the nav/rad had locked the Al.17 on to the target, the Firestreak IR head would be 'slaved' to the radar – it would point in the same direction as the radar dish, but only over a restricted cone [area].

"If one allowed the target to exceed that angle, even though it would be seen on

"The Javelin's gun armament was not a poor man's option but very destructive in its own right, quite capable of downing such a target."

The third element of the potential threat from the Indonesian Air Force was from low-flying, fast and manoeuvrable small piston-engined fighters.

"They were known to have the P-51 Mustang and this gave us much food for thought. A hit-and-run attack on the crowded island of Singapore, not to mention the damage it could do to one of our crowded airbases, was not to be contemplated. With so little possible early warning, one would be intercepting it on the way out rather than on the way in.

"We practised low-level interceptions extensively. The usual training area, out in the Straits, was also somewhere the local fishermen built their fish traps – rickety constructions using bamboo, but they still came up on the radar. So, it was a case of detecting which response behaved differently from all the others.

"On the plus side, if one did get the radar

prior to the start of night flying, soon after six in the tropics.

"An armed aircraft was held at a high state at all times. The aircrew could rest, even sleep, fully kitted up in the crew room but had to be wheels rolling within two or three minutes. It was exciting and was called 'Op Tramp' or QRA.

"The nav/rad just had to make a note of the scramble instructions, get strapped in and get his breath back, as his real job started at take-off, when he could fire up the radar. The pilot had the real work to do before then. Experience was all-important to get through the pre-take-off checklist and other essentials with no delay."

## FINAL DAYS

Towards the end of the Javelins' service life many were stored at 27 MU (Maintenance Unit) at RAF Shawbury, Shropshire, where Fred Butcher was posted as unit test pilot (UTP) in 1964.

He recalled: "On return to England [from 64 Sqn in Singapore] I was asked if I would like to be test pilot at Shawbury as they were



Three 64 Sqn Javelin FAW.9Rs with a Vickers Valiant for air-to-air refuelling training. Key Collection

the radar it would no longer be seen by the Firestreak, which would therefore lose acquisition and not go."

Geoff said the weapon had one definite limitation: "The coolant for the IR head was, I think, ammonia, and you started to use it up as soon as the pilot armed the missile.

"The total arming time possible was about 30mins I believe, but it could have been even less. So, choosing the moment to arm, which itself took a noticeable time, during the interception was a case of 'not too soon, not too late'.

"The missile also had a built-in delay after launch before its warhead was armed, so there was a minimum range at which it could explode. This no doubt was to avoid the possibility that it could shoot down the launch aircraft. If launched too close, it would pass the target before exploding.

"If it had come to a shooting war, pilots closing in on something like the Hercules at night, and instructed to engage it, would have preferred to use the 30mm cannon. To close in to identify the target and then drop back to launch Firestreak would not appeal.

to lock on to the aircraft target, it would usually quite effectively hold lock to allow one to follow evasive action.

"Of course, if one was bloody-minded when flying as the target, one could fly over as many fish traps as possible by day; perhaps a bit more circumspect at night."

According to Geoff, the missile did not have a real capability under those conditions. "I doubt if it would have 'seen' a single piston-engined aircraft, even under ideal circumstances at night.

"It's also not really necessary to point out that carrying out very low-level practice interceptions of that sort was innately hazardous, and one was appreciative of the skill and experience of the pilots on Sixty at that time.

"I owe a debt of gratitude to the Sixty Squadron aircrew that saw out the Javelin's final years, not least to Mike Miller, and most especially also to our ground crew. They nurtured that sometimes fickle aircraft to meet any task thrown at us.

"When we were relaxing in the interval between the day flying programme which finished by midday our ground crew were out in the heat of the sun servicing our aircraft

starting a Javelin programme there. The incumbent TP did not fancy the Javelin, and I was in the right place at the right time.

"The Javelin proved to be a very minor part of the job. The aircraft came in from their units, they underwent major servicing or mods and I would test them and return them to their units. In a nutshell, that was my job at the MU.

"When I was UTP at Shawbury, we had a Javelin in from the OCU: XH898. The servicing had been carried out and it had been stripped ready for repainting. However, we had an urgent call from the OCU: they were prepared to accept it without the paint finish so I flew it up to Leuchars, Scotland, on May 12, 1966. Of course, it made it unique."

By 1965 most of the Javelins in service in the UK and West Germany were replaced by the Lightning, with Sixty the last operational squadron flying the type – which retired from frontline service with the unit's disbandment at the end of 1968.

But it was not entirely the end for the Javelin, as a single aircraft continued to fly with the Aeroplane and Armament Experimental Establishment (A&AEE) until 1975. **AN**



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# FIREFIGHTING JUMBOS

The versatile and much-loved Boeing 747 has now proved itself as a vital weapon against large-scale blazes. **Frédéric Marsaly** details how the type has been modified to undertake the aerial firefighting role.



**U**ncontrolled blazes ripping across vast areas of inaccessible and often mountainous country are a nightmare for firefighters.

They put their lives at risk trying to save people and their homes and businesses as flames leap through tinder-dry trees and undergrowth. In such cases firefighting aircraft can be a vital tool.

The time appeared ripe in the early 2000s for a new generation of aircraft to tackle major outbreaks. The fires seemed never to have been so numerous and so huge. They destroyed swathes of North America and included the Thirty Mile Fire in Washington state in 2001, and Okanagan Mountain Park Fire in British Columbia, which displaced 45,000 people.

**Evergreen Tanker 979 makes a demonstration drop in 2009 at Châteauroux, France.** Frédéric Marsaly

After the crash of two firefighting aircraft, a Lockheed C-130 Hercules and Consolidated PB4Y-2 Super Privateer, it was found fatigue cracks had caused the accidents and federal safety authorities raised concerns about the use of ageing, surplus military aircraft for firefighting.

## NEW BEGINNING

Two years later, the United States Forest Service (USFS) took the decision to ban many types of tankers it now considered as too old. It prompted the launch of modification projects.

The New Mexico-based 10 Tanker company introduced a McDonnell Douglas DC-10 air tanker in 2004 with a 12,000 US gal (45,425 lit) constant flow tank and, at about the same time, Evergreen International Aviation, from Oregon, showed its Boeing 747-200 with a pressurised drop tank containing a similar amount of liquid. Both aircraft led to the creation of a new category in the tanker classification, the VLAT, Very Large Air Tanker.

Evergreen had significant experience in this specialist area. In the 1970s and 1980s, before becoming a Boeing 747 cargo airline, the operator was heavily involved in firefighting with Boeing B-17 Flying Fortress and Lockheed P2Vs Neptune tankers, under USFS contracts. It also had a 'heavies'



helicopter branch, used for forestry activities, but also firefighting.

## FIRST MODIFICATION

Around \$50m was allocated to create a new tank system, to modify a 747 and for testing. The first Evergreen drop system was built on a roll-on/roll-off platform, loaded and unloaded through the nose door of 747-273C N470EV. Changes to the fuselage allowed for a four-nozzle drop system, aft of the main landing gear as a fixed installation.

First tests in 2004 were over a huge drop zone, created close to Marana Regional Airport, Arizona. Certification was granted in 2006 and the first public presentation took place a few weeks later in Sacramento, California.

It was the start of a long run of aerial presentations with only one goal: to convince local or federal administrations to trust such a large and expensive aircraft.

Evergreen explained how its tanker worked in a different way to water 'bombers', which had to drop their loads at low levels. The Supertanker's pressurised system enabled the aircraft to fly higher, around 820ft (250m), with the same efficiency. The cargo company emphasised the versatility of its aircraft which, it said, was able to drop large loads of retardant against fire, but could undertake similar tasks with dispersant during oil spills.

Aircraft N470EV failed to win any contracts and was returned to cargo configuration after around two years. Evergreen turned to an older, less profitable Boeing 747-100 to continue the firefighting challenge.

## SECOND CONVERSION

Boeing 747-132C N479EV was selected and designated Tanker 979. A new tank system was permanently installed, designed with a lighter, aluminium-built mechanism, and without the roll-on/roll-off cradle because the

aircraft had only a large side cargo door. It received Interagency Tanker Board approval in March 2009.

A European tour followed with a first display in Châteauroux, France, on July 16. Five days later, it arrived in Ciudad Real, in central Spain, south of Madrid. It could not have been timed better. Five Spanish firefighters had died tackling a massive blaze only a few days before. The Supertanker made its first operational drop on a fire in the mountainous Cuenca area on July 22, 2009 (only one drop was performed). A final demonstration was held near Frankfurt, Germany, three days later.

Back in the USA, it won a short-term contract to help Alaskan firefighters, making a few drops close to Fairbanks on July 31.

Late summer brought a further short-term contract to intervene over the huge fires in the Los Angeles area.

The next mission came more than a year later in Israel, in December 2010, tackling the devastating Mount Carmel fire in which at least 40 people died.

Evergreen's contribution was part of an international fleet of tankers and water bombers, many from European countries. A few months later, in April 2011, the aircraft deployed to Mexico to fight fires in Coahuila area.

There was an ominous pattern to the aircraft's work: all temporary contracts. With no long-term deals, the aircraft was grounded and its engines removed for use on other Evergreen 747s.

The company harshly criticised the lack of support from the USFS, pointing out there was a serious lack of tankers following the grounding of Californian operator Aero Union's P-3 fleet for safety reasons. At the time, fewer than ten large air tankers were active over numerous fires in US western states, and all were P2Vs Neptunes – the P-2 first flew in 1945.

The forestry service looked to the future in 2013 when it published contracts in the

following months for next-generation tankers such as the BAe 146, Avro RJ85, McDonnell Douglas MD-87, C-130H, DC-10 and the Boeing 747 Supertanker.

The three-year 'Call When Needed' contract promised \$75,000 per day and \$12,000 per flying hour when activated, but Evergreen's firefighting 747, which had not been flown for some time, need to be overhauled and pass a maintenance D-check.

The company decided to postpone the Supertanker's return by one year and aimed to come back in time for the 2014 fire season.

By then, however, Evergreen had been brought to its knees. Its main activity was flying cargo for the Department of Defense as the US Army withdrew troops from Afghanistan. The federal government shutdown in October 2013, due to a budget impasse, led to the termination of the contract.

Evergreen halted operations in November. All its aircraft were grounded, and it went bankrupt in December. The Supertanker remained in Marana while the owner's assets were auctioned.

## NEW COMPANY

Given the hourly and daily rates, a USFS contract appeared lucrative. The terms were attractive to former employees most deeply involved in the Supertanker project. They created a new dedicated company, Global SuperTanker Services (GSS).

When GSS bought Evergreen's firefighting assets, spare parts and patents, it included only the first dropping system, which had been cleanly stored in Marana. When the second Supertanker was stored, the whole system was taken off the plane, but was nowhere to be found at the time of liquidation. GSS also acquired a younger, more efficient aircraft – a Boeing 747-400.

GSS chose a 747-400 because of

Global SuperTanker Services Boeing 747-446(BCF) Tanker 944 landing at McClellan Airfield in March 2016. Jim Dunn





its improved efficiency. They were being sold after more than 20 years' mainstream service but the airframes still had plenty of life, especially when firefighting aircraft typically fly no more than 500 hours a year.

For example, N744ST had flown 75,000 hours, but a properly maintained 747 can log 100,000 flight hours. This variant's more powerful engines also gives a more favourable thrust-to-weight ratio.

A more modern aircraft had less expensive and speedier maintenance processes, reducing immobilisation times and costs for the essential works. The 747-400 also had a glass cockpit, with standard navigation, systems management and operating apparatus conceived for a two-man crew. Previous Supertankers being based on earlier 747s also had a flight engineer.

After being bought by GSS, N744ST quickly went through a C-check in Victorville, California. On January 23, 2016, it flew to Marana, Arizona, for a gleaming and spectacular paint job and was christened *Spirit of John Muir*, after the famous

Scottish-American writer/adventurer, who was also a naturalist and a pioneer in the environmental movement.

It is based at Colorado Springs and the first public display was on March 22, 2016 in Sacramento at an aerial firefighting conference held at McClellan Airfield.

During the repainting of the aircraft in Marana, the drop system taken from the first Supertanker, cleared of its now useless pallets but retaining its 19,813 US gal (75,000 lit) capacity, was also installed.

The first ground test drop was made on April 30 with the first test flight and aerial drop following the next day.

The crew was Cliff Hale, GSS Chief Pilot and former Evergreen Supertanker captain – the man who flew more than 90% of trial and demonstration flights, as well as every operational drop. First officer was Tom Parsons, an experienced tanker pilot who had flown with Neptune Aviation.

A third seasoned pilot, who was in the process of extending his type rating, was also hired. Rough terrain testing became his responsibility.

## THREE-MAN CREW

For most passenger or freight flights, Boeing 747-400s require only a two-man crew, but firefighting is different. GSS created a third crew position called a Drop System Operator (DSO).

Bob Soelberg, GSS Vice President and Supertanker programme manager, told the author: "Global SuperTanker has felt from the beginning that both pilots need to be focused on flying and communications, not drop system set up. For that reason, we have modified the flight deck to allow Don Paulsen, our Chief Safety Officer and former flight engineer, to act as our DSO."

Positioned in the centre jump-seat, Paulsen is responsible for selecting the proper settings for the retardant release system, according to the situation and the requirements from the authorities, and advising the pilots when the system is ready to drop. In Evergreen's Supertankers, the flight engineer was in charge of the release system, with some information also displayed on the cockpit's centre console.

On the new installation, everything is



The underbelly of Tanker 979 showing four nozzles, aft of the main landing gear.  
Frédéric Marsaly



On board Tanker 979: the tanks system was similar to the first Supertanker's but made with lighter materials. Frédéric Marsaly



According to Evergreen, the Supertanker's pressurised system allows it to drop with accuracy from 800ft, when other tankers drop from around 100ft. Evergreen





The first 747 Supertanker was a -200 with a cargo nose door with the tanks on a roll-on/roll-off device. In 2008 Tanker 947 was returned to freight activities. Evergreen

## THE THREE SUPERTANKERS

### Boeing 747-273C N470EV, Tanker 959

MSN 20653 (237th Boeing 747)

It was built in 1974 for World Airways (registered N749WA) and flown by the operator until May 1987, interspersed with several leasing periods. These included times with Korean Air Lines, Braniff, Viasa, Lufthansa, American Airlines and Flying Tiger Line when it was converted to a freighter.

In 1989, it was bought by Evergreen and leased to Southern Air Transport from 1994 to 1995. Back with Evergreen, it became the first Supertanker from 2004 to 2008 before reverting to a freighter until 2012. Phased out, it is stored at Pinal Airpark, Arizona.

### Boeing 747-132C N479EV, Tanker 979

MSN 19898 (94th Boeing 747)

Built for Delta Air Lines in 1970, it went back to Boeing in 1975 then was leased to China Airlines for two spells. Guinness Peat Aviation had the aircraft for a brief time in 1984 before it went to Pan Am in May 1984. Bought by Evergreen in 1991, it was converted to a freighter before being leased to Garuda in 1991. It was back with Evergreen the following year and flew regularly before conversion to a fire-bomber role in 2009. It operated in Spain, Alaska, the USA and Mexico. It was stored at Pinal Air Park in 2011 after its last mission.

### Boeing 747-446(BCF) N744ST, Tanker 944

MSN 25308 (885th Boeing 747)

Built in 1991 as a Boeing 747-446, the aircraft first flew on October 25, 1991 and was delivered to Japan Airlines the following month, registered JA8086. It was in passenger service until 2010. AerSale, a company dedicated to second-hand aircraft market, bought the aircraft as N238AS and turned it into a 747-446(BCF) freighter, selling it on to Evergreen (as N492EV) in 2012.

In November 2013, when Evergreen closed, the aircraft was put in storage in Victorville, California, and bought by GSS in 2016.

designed to be in the DSO's reach. This new job can be offered to former flight engineers as well as seasoned air mechanics. A second DSO has been hired who is a pilot and can also fly as a first officer.

The new aircraft was further improved. Supertanker operations not only need an airfield with a long and sufficiently resistant runway, they also require an air compressor, necessary for the pressurised release system. GSS thought about installing two compressors on board, enabling the aircraft to 'arm' its own equipment.

Fresh wiring was pre-installed for potential new equipment, such as data management requirements but, as yet, these modifications are for the future. The

aircraft still conforms to Evergreen's original supplemental type certificate (STC).

Soelberg said: "Some pre-positioning of components will allow us to respond to future requests for various data output. This decision [not to make new installations right now] was based on the lack of clear guidance on which system would be most common among the various agencies, as well as our desire not to delay the FAA STC process."

When the second Supertanker went to Châteauroux, in July 2009, Evergreen was already considering night operations, thanks to the aircraft's ability to drop higher than conventional tankers, avoiding risks associated with flying too close to the ground.

GSS is also considering the potential for round-the-clock operations and has analysed experience from Los Angeles Fire Department helicopter pilots, who have considerable experience.

To add night visual flight rules (VFR) capabilities to the Supertanker, many options were considered, including modifying the cockpit so it could be used while wearing night-vision goggles. No decision has yet been made.

Among VLATs, the Supertanker is also unique in that it could work on oil spills. Evergreen began this work after the Deepwater Horizon disaster in the Gulf of Mexico in 2010.

Aircraft N744ST will be able to release ►



This 747 saw firefighting action in Spain, Alaska, California, Israel and Mexico but was never awarded a contract with the US Forest Service.

Frédéric Marsaly





**The flight engineer's panel on Tanker 979 showing the drop system control to the lower right. All tanks are empty.** Frédéric Marsaly

oil dispersant as soon as it is certified. Since the dropping system comprises two individual, parallel, independent 9,906 US gal (37,500 lit) lines of tanks, GSS says the Supertanker could also work as a fire suppression tool and an oil dispersant vector at the same time.

## WORLDWIDE TASKING

From its base in Colorado Springs, the aircraft can reach the Gulf of Mexico within three hours and arrive anywhere in the world in about 20 hours. Soelberg said: "Our niche is the ability to respond quickly to areas

of the world where local capabilities are limited."

The main question now is: will the USFS, which still lacks some firefighting aircraft, need the services of a 747, as it indicated it would back in 2013?

GSS is also talking to Australian authorities, which has been successfully using one of 10 Tanker's Douglas DC-10s for the last three years, and to the European Union's Emergency Response Coordination Centre.

The 2015 season was particularly arduous and there was intensive use of VLATs,

particularly, the three DC-10s belonging to 10 Tanker. It wasn't until the following year that the Boeing 747-400 was able to demonstrate its capabilities. Due to a late rainy season, many fires broke out around the harbour city of Haifa, in northern Israel.

Many countries answered the call for help and GSS Tanker 944 left Colorado Springs



**The GSS Supertanker in an aerial firefighting conference display at McClellan Airfield in 2016.** Jim Dunn





on November 24, 2016 for Tel Aviv. The following afternoon it began a long sortie.

Most of the time was in a holding pattern off the coast waiting for an opportunity to drop the load. The aircraft finally headed to Jerusalem where it dropped a full tank in front of Israeli TV and journalists. The next day a drop was organised close to Haifa. For GSS, it was a superb opportunity to demonstrate the intercontinental capabilities of its 747 to a worldwide audience. All the fires were extinguished by the 747 and an

gal (523,900 lit) of water mixed with a fire suppression agent, Pyrocool, dropped.

The GSS team used a Panther CA5 airport firefighting truck to pump the water to fill the huge aircraft, doing so on one occasion within 13 minutes.

It returned to Colorado Springs on February 14 after 42 drops and 830,000 US gal (3,141,891 lit) of water and Pyrocool released over the Chilean fires. For the summer season GSS announced that Douglas County, Colorado, had signed

to fight wildfires. The 17-month approval timescale is similar to that given to other aerial tanker operators and marks a key milestone for the company enabling it to compete for state and federal contracts in the US. However, this is just the first step as the company currently doesn't have a contract with the USFS to fight fires.

After a flight test drop over McClellan Airfield in California, GSS received a contract in August from the state's Cal Fire on a "Call When Needed" basis to fight fires

## ***'The Global Supertanker was hired with the help of a private foundation held by philanthropist Ben Walton, grandson of the founder of Walmart, and his wife Lucy Ana, who grew up in Chile.'***

international waterbomber fleet before the Supertanker returned to the US.

In the middle of December, Chile was hit by huge wildland fires. In a few days, hundreds of houses were destroyed and thousands of people had to leave their homes.

The Supertanker was hired with the help of a private foundation held by philanthropist Ben Walton, grandson of the founder of Walmart, and his wife Lucy Ana, who grew up in Chile. Global's Supertanker went to Santiago on January 24.

The 747-400, assisted by a Chilean Navy Casa 295M as a lead plane, made two drops the following day on its first mission. February 1 was the busiest time with seven sorties and a total of 138,400 US

a 'Call When Needed' contract for the Supertanker, which was seen as a small but significant step.

At the end of June, the aircraft carried out a few drops over Fox Field, California, to assess the distribution of its drop pattern for the USFS. This was regarded as a normal procedure and not necessarily heralding future contracts.

The GSS success in Chile has increased the company's chances of winning work in the complicated and expensive business of aerial firefighting. It is clear the Boeing 747 offers opportunities for long-range intervention at short notice.

GSS's 747-400 has received a 17-month interim approval from the US Interagency Airtanker Board (IAB) on July 25 this year

in California. On August 31, the aircraft made its first US drop over the Ponderosa fire, close to Oroville. It was later engaged against a huge fire in the San Bernardino area.

Harry Toll, Chairman of GSS, said: "We must be given the chance to protect our citizens from one of nature's most destructive forces. As we have previously proven in Israel and Chile, we look forward to getting involved in the fight against wildfires in the US."

When Boeing engineers designed the 747, few could have imagined that one day it would be used for firefighting. The role for which it has been adapted has added another chapter to the jumbo jet's impressive story. **AN**

**The Supertanker performing a test for US Forest Service in Fox Field, California, in July 2017. Steve Whitby**





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Qantas Boeing 747-400 VH-OJI lifts off from Sydney Airport. [AirTeamImages.com/Sarmad Al-Khozaie](http://AirTeamImages.com/Sarmad-Al-Khozaie)

# BOEING 747-400 BEST-SELLING VARIANT

More Boeing 747-400s were built than any other variant and it was arguably the most successful. **Joe Copalman** explains why.

**T**he initial success of the Boeing 747 had dipped by the early 1980s, competitors were offering aircraft that, while not quite matching the 747's capacity, provided advantages in terms of reduced crew, improved flight controls, and, most importantly for operators, focused on healthy bottom lines with improved fuel efficiency.

Boeing attempted to renew interest as sales flagged by producing the 747-300, a variant offering increased passenger capacity by making the stretched upper deck standard, but little else in the way of improvements. A total of 81 were built, but the message from the airlines was clear – up-to-date technology and greater efficiency trumped sheer capacity.

In developing the latest 747-400, Boeing focused on upgrades in five key areas:

- Increasing range by 1,000nm/1,852km;
- Modernising the interior;
- Using newer and more efficient engines;

- Upgrading the avionics and in-flight entertainment systems

- Reducing operating costs by 10%

Boeing's first customer for the 747-400 was Northwest Airlines, which ordered ten in October 1985. This was shortly followed by orders from Air France, British Airways, Cathay Pacific, Japan Airlines, KLM, Lufthansa, Singapore Airlines and United. The design process for the 747-400 was guided in part by a consultative panel comprising seven of the type's pre-production customers – British Airways, Cathay Pacific, KLM, Lufthansa, Northwest, Qantas, and Singapore Airlines – which provided input to ensure the final product met their common needs. The group were in favour of a glass cockpit which Boeing agreed was a good idea.

Physical design of the -400 differed from that of the Classic 747 models (the -100, -200 and -300) in several ways. The most obvious was the carry-over of the -300's stretched upper deck as standard on all

production passenger models (purpose-built -400 freighter variants retained the earlier 747's smaller 'hump'). Most of the other design changes made were with an eye on increased range, greater efficiency and reduced operating costs.

The most apparent change from the -300 was the addition of upward-canted, 6ft-tall (1.83m) winglets, making the 747-400 the first airliner to be equipped with that particular type of wing-tip device, which increased the type's range over the -300 by 3.5%. The winglets capped off an expanded-span wing with 17ft (5.2m) added to the 195ft (59.6m) wingspan of the Classic 747, with the wing itself constructed of an aluminium alloy that resulted in a 6,000lb (2,700kg) reduction in weight over the wing on the -300.

As with the earlier 747 variants, a range of new engines were made available for the -400 based on the desires of the individual customers. Over the course of the first half of 1989, the 747-400 received FAA





The first Boeing 747-400, N401PW, features the names of the customers that had ordered the airliner on its side.  
Key Collection



Air India continues to operate four 747-400s, this aircraft was photographed in the airline's previous livery. Key Collection



Japan Airlines ordered 34 747-400s, eight 747-400Ds and two 747-400Fs from Boeing. Key Collection



As a purpose-built freighter, this Yangtze River Express 747-400F illustrates the distinctive short upper-deck 'hump'. Paul Dunn



# FLYING THE FOUR HUNDRED

## British Airways Boeing 747-400 pilot Paul Dunn describes being at the controls of a “masterpiece of design”

It's been my privilege to fly the 747-400 for just over ten years. During that time I have developed a huge amount of respect and no little affection for an aircraft almost universally considered to be the 'Queen of the Skies'.

It sounds obvious to say it, but what struck me about the aircraft when I approached it for the first time was its size. I came to fly the 'Four Hundred' (as it is known to those in the airline) having spent five years flying the Airbus A320 series, a type that had also initially seemed large to me.

Over the years I found I got used to its size, though in ten years of flying the 747, it has never stopped being a huge and very impressive machine.

Aside from its size, the aircraft is simply a masterpiece of design. Few aircraft can match its good looks and 'ramp presence', even when stationary on the gate.

The large size of the airliner gives pilots a totally different perspective, from the flight deck perched high on the upper deck. The first time I sat in the pilot's seat, it was a few minutes before I realised I was looking at the roof of the terminal, rather than the passengers in the departure lounge at eye level. When the aircraft is on the ground, the pilots sit almost 30ft (9.1m) up, around double the distance on smaller airliners. This creates challenges when manoeuvring on the ground, and more dramatically, when landing the aircraft – more of that later.

Taking off in the Four Hundred is always impressive. The aircraft has a huge reserve of power and, like most modern aircraft, rarely needs all of it to get airborne. Most take-offs are conducted with less than full power, with a computerised performance programme routinely used to calculate a reduced setting. This reduces wear on the engines and indeed makes the aircraft easier to control during take-off, while still providing plentiful safety margins in case of any problems.

### A FORCE OF NATURE

On the runway, the thrust levers are advanced to roughly 50% power and allowed to stabilise briefly before pressing the TOGA (Take Off/Go Around) switch, which rapidly delivers the preset take-off power. If the initial movement of the thrust levers feels like the aircraft coming to life, pressing the TOGA switches feels like unleashing a force of nature. It would be silly to claim that the initial acceleration is anything other than steady, however the roar of four Rolls-Royce RB211s (other engine options are, of course, available) provides a tremendous sense of power and a real feeling of reliability and security.

At high weights or at high-density altitude airfields (such as Mexico City and Johannesburg), the take-off run can take around a minute, which can seem a rather long time. At the appropriate rotation speed, the nose is raised towards an attitude of 15°. The aircraft gets airborne around halfway through this rotation and, particularly at higher weights, you can really feel the moment the wings reach the magic angle of attack and start to produce lift, dragging the rest of the aircraft into the air with them.

Once airborne, initial climb is performed at a constant speed ( $V_2 + 10\text{kts}$ , with  $V_2$  being the take-off safety speed, generally between 160 and 180kts (depending on weight) before reducing the pitch attitude and accelerating at around 1,000ft (305m). The acceleration and clean-up phase involves four changes in flap setting resulting in the aircraft reaching a speed of  $V_2 + 100\text{kts}$  (in the region of 260-280kts) with gear and flaps retracted. Handling throughout this phase is superb. The 747 is responsive in both pitch and roll and the controls never feel heavy. Despite this, the aircraft's bulk remains apparent; its size and weight means that it is very stable and rides any rough air at lower altitudes really well. The delightful handling characteristics of the 747 series must be considered in the context of the aircraft's original design.

Despite in some ways being a dramatic improvement on the 747 Classic (BA operated the -100 and -200), the 747-400 still shares most of its overall design with its forebear, an aircraft designed without modern Computer Aided Design (CAD) and produced long before fly-by-wire (FBW) systems became commonplace. It is a great testament to the original design that the development team managed to get it so right.

### FLIGHT DECK

The -400's flight deck design is very much a product of its time. The improvements over the Classic 747 cockpit are obvious, with the EFIS (Electronic Flight Instrument System) screens and much simplified panel layout, along with the loss of the flight engineer position. Although the flight deck is clearly dated when compared with the current generation of airliners, it still allows for great situational awareness and is a pleasant working environment.

Although the aircraft is certified for two-pilot operation, on longer sectors one or two extra crew members may also be carried. This allows for crew breaks, which enables us to extend our legal flight duty period. The flight deck is equipped with a crew rest area that includes bunk beds, which are surprisingly comfortable.

On final approach, the handling characteristics

of the aircraft remain superb. The aircraft is sensitive to small changes in pitch attitude, but very stable in pitch and roll. Like all aircraft with engines mounted under the wings, the 747 has a pronounced pitch/power couple, meaning that any changes in power will tend to cause the aircraft to change its pitch attitude. More modern airliners, with FBW controls, no longer have this tendency as the computer system automatically compensates for it, but the 747 requires control (and trim) inputs every time the thrust levers are moved. This can be a challenge for new pilots converting from other types, but it's something that rapidly becomes second nature.

At around 200ft (61m), the aircraft enters 'ground effect'; due to the cushion of higher pressure air under the huge wings coming into contact with the earth. This has a tendency to slightly reduce the rate of descent and requires awareness and a gentle correction, again something that soon becomes second nature.

The aircraft's size and geometry causes the pilot's view during landing to be very different from a smaller airliner. The landing flare is performed at 30ft (9.1m), measured on the radio altimeter, however due to the height of the flight deck and the attitude in the flare, along with the lateral distance between the flight deck and the main landing gear, the pilots are more than 40ft (12m) in the air when the main gear touches down. This is something that does initially take some getting used to, as the visual picture is so different from smaller aircraft and you really do feel very high over the runway. Once you get your head around that, it is something that you get used to, and the aircraft becomes relatively straightforward to land.

After touchdown, the aircraft still needs to be 'flown' on the runway as the sharply swept wing is quite susceptible to crosswinds, which have a tendency to lift the wing on the upwind side; application of aileron into wind is essential to keep control down to taxi speeds.

When disembarking, it's impossible not to admire the aircraft from the jetty or terminal. When I was under training, at the start of my career on the 747-400, after one sector I got caught by the training captain gazing back at the aircraft on stand. He nudged me, smiled and said: "You just landed that." Despite the fact that it is no longer the biggest airliner in the sky, or the most efficient, or the even the most prestigious, I would like to think that it's the coolest and almost certainly the best looking. Respected and admired by its crew and passengers alike, the genuine and original jumbo jet and in my opinion The Queen of the Skies.



British Airways was one of the type's pre-production customers which provided input to the design process to ensure the final product met their common needs. Key Collection



## BOEING 747-400 OPERATORS (AS OF AUGUST 2017)

Operator	No. in use	Variant	Operator	No in use	Variant
Air China	3	747-400	KLM	3	747-400F
Air India	4	747-400		4	747-400
Asiana	2	747-400		11	747-400M
	1	747-400M	KLM Cargo	3	747-400ERF
Asiana Cargo	10	747-400F	Kuwait Airways	1	747-400
Atlas Air	4	747-400	Lufthansa	13	747-400
	2	747-400BCF	Martinair	1	747-400BCF
	21	747-400F	Nippon Cargo	3	747-400F
British Airways	36	747-400	Qantas	4	747-400
Cargolux	2	747-400ERF		6	747-400ER
	6	747-400F	Saudia	7	747-400
China Airlines	6	747-400	Saudia Cargo	5	747-400BDSF
China Airlines Cargo	18	747-400F		1	747-400F
China Cargo Airlines	2	747-400ERF		2	747-400ERF
	1	747-400F	Thai Airways	10	747-400
China Southern Cargo	1	747-400F	United Airlines	13	747-400 (last flight November 7)
Delta Air Lines	7	747-400	UPS	2	747-400BCF
EI AI	5	747-400		11	747-400F
EVA	2	747-400F (last flight August 21)	Virgin Atlantic	8	747-400
EVA Air Cargo	2	747-400BDSF			

certification with Pratt & Whitney's PW4056 engines, General Electric CF6-80C2s and Rolls-Royce RB211-524Gs. Each offered greater thrust with lower fuel consumption, and were governed by full-authority digital engine control (FADEC), further contributing to Boeing's planned reduction in operational costs.

Modern flight controls were another one of Boeing's five design priorities, with one of the primary goals being the reduction in flight crew from three to two, eliminating the need for a flight engineer. This was done through the inclusion of cathode ray tube digital displays that consolidated the information presented by numerous dials and gauges on to easy-to-read screens. Additionally, the -400's cockpit layout was greatly simplified, with Boeing eliminating two-thirds of the -200's switches and gauges. All these changes put the tasks once performed by a flight engineer in the hands of the pilots. Having one fewer crew member every flight brought Boeing closer to its target goal of a 10% reduction in operating costs.

Seoul-based Korean Air operated both passenger and cargo variants of the 747-400. Key Collection



Other variants followed, including the 747-400D ('Domestic'), a high-capacity, short-haul variant for domestic routes within Japan. Japan Airlines and All Nippon Airways both flew the -400D, which was modified for the short-haul profile in a number of ways. These included

### DELIVERY AND VARIANTS

The 747-400 entered service on February 9, 1989, when launch customer Northwest Airlines flew the first aircraft delivered (N661US) on its Minneapolis, Minnesota to Phoenix, Arizona route. The type's first European customer, KLM, began using the type in May 1989, as did the first Asian operator, Singapore Airlines, which flew the -400's first international revenue flight from Singapore to London on May 31.

Shortly after the -400 entered revenue service, the first variant of the type, a swing-role passenger/freight model known as the 747-400M (also referred to as the 'Combi') was rolled out at the manufacturer's Everett, Washington plant.

removing the winglets, replacing the upper-deck galley (unnecessary on short flights) with additional seating, which was configured in a high-density seating arrangement, using either a three-class layout enabling a maximum capacity of 568 passengers, or two-classes for up to 660 passengers. These were the maximum numbers that could be carried on any 747 variant produced.

At the opposite end of the spectrum from the short-haul -400D was the 747-400ER or 'extended range', a variant manufactured specifically for Qantas to fly on its Sydney to Los Angeles route. The -400ER offered 500 miles (805km) greater range over the standard -400, and was first delivered to Qantas on October 21, 2002. Only six



Northwest Airlines (NWA) was a major user of the 747-400. Following a merger, the aircraft passed to Delta. Key Collection





Singapore Airlines retired its last passenger Boeing 747-400 on April 6, 2012. Key Collection

passenger 747-400ERs were produced.

The 747-400 also enjoyed success as a freighter. The first pure-freight version, the 747-400F, was delivered to Luxembourg-based freight carrier Cargolux in May 1993. Boeing built 126 of the -400F.

The company took the cargo version further with its development of the 747-400ERF extended-range freighter, a development of the 747-400ER that offered the ability to carry an additional 22,000lb (9,980kg) of cargo than the standard -400F. At maximum capacity, the -400ERF still held a 326-mile (525km) advantage over its predecessor. Deliveries began in October 2002 and were completed in 2009. A total of 40 -400ERFs were produced with the last example being for Kalitta Air and handed over on December 22 of that year. This was the final -400 of any variant delivered by Boeing.

## SPECIALIST ROLES

Along with passenger and freight variants, the 747-400 has been used in several one-off configurations for very specific roles. The sole 747-400 operated by the US military was the YAL-1A Airborne Laser, a 747-400F that was extensively modified to house a chemical oxygen iodine laser (COIL) for use as an anti-ballistic missile platform. Assisted by three lower-power lasers for tracking and targeting, the COIL system was validated against three ballistic missile targets in February 2010, destroying two and successfully engaging the third, all in the boost phase of flight. Concerns about a lack

of standoff range led to cancellation of the programme in 2010, after which the YAL-1A was flown to Davis-Monthan AFB, Arizona for storage in 2012, before finally being scrapped in 2015.

aerial firefighting – employing these aircraft for wildfire suppression work in both the United States and abroad from 2009.

Evergreen's bankruptcy however was not the end of the story for the 747 in this role.

In 2013, Colorado Springs-based Global SuperTanker Services purchased the tank system used on the 747-200 and installed it in a 747-400BCF. Beginning operations in May 2016, Tanker 944, as N944ST is known, gained its first US contract providing call-when-needed wildfire suppression services for Douglas County in Colorado. When the 2016 summer fire season in the US ended, Tanker 944 flew to Israel and then Chile to fight blazes in those countries. The company's largest contract to date, signed in September of this year is with the state of California, augmenting CalFire's fleet of Grumman S-2T Trackers. For more on the firefighting 747s see the article that starts on p34.

The use of an airliner as a launch platform for rockets is not a new concept – Orbital ATK has operated its modified Lockheed L-1011 TriStar named *Stargazer* in this role since 1994, and has successfully placed 40 payloads into orbit to date. In December 2015, Virgin Galactic announced

its intent to convert a Virgin Atlantic 747-400, named *Cosmic Girl*, for its LauncherOne orbital launch vehicle. Virgin Galactic set up Virgin Orbit for the venture and, with assistance from partners L3 Platform Integration and VT Aerospace, plans to

## CHANGING TO THE 400

*Aviation News* spoke to Tony Buttacavoli, a pilot who had flown both the 747-200F and the 747-400BCF, a freight variant converted from standard -400s with the stretched upper deck, distinguishing it from the short-humped -400F and ERF variants, for a major American freight carrier.

Buttacavoli flew the Classic from May 2011 to December 2012, and described it as, "an old school Boeing jetliner, three seats up front, a slew of steam gauges everywhere, a pretty good FMS (flight management system), and only minimal glass in the front office."

He said the aircraft: "was long in the tooth, and showed it, with an autopilot that couldn't handle localiser intercepts, and systems that needed TLC, via the crew chief's gentle touch on a regular basis."

The -400, which he flew from April 2013 to September 2014, was a different beast in many ways. Buttacavoli explained: "The -400 was near state-of-the-art with full glass [cockpit], full-performance FMS, two-man crewed, auto throttle-equipped 'liner that automated nearly all the functions that were performed by the flight engineer."

He continued: "Aesthetically, and performance-wise, they were two separate and distinct ships. The Classic, with her mini-hump and wingtip HF ailerons, embodied Joe Sutter's jumbo dream in all her original glory. The 400BCF, with a large and long upper deck, winglets, bigger wing, and longer fuselage, was truly the jumbo dream 2.0. In every performance index the 400 exceeded the Classic by leaps and bounds. In the 400 loaded we could fly Hong Kong to Anchorage non-stop. In the Classic a tech stop in Khabarovsk [southeast Russia], or Nagoya [Japan] was necessary. That's just one example."

Regardless of which model he flew, Buttacavoli's affection for the 747 is undeniable. He recounted: "There was a sense of grandeur that came from flying both ships, whether it was pulling a contrail banner high over the mid-Atlantic, leaping oceans and continents in single bounds, or close-in manoeuvring while hand-flying this ship in the approach environment and marvelling at that steady, solid feel through the yoke. Very few things in life meet the hype surrounding them. The 747 exceeds it."

The concept of using 747s for aerial firefighting goes back to 2002, when Evergreen International of McMinnville, Oregon began development of the 747 Supertanker. Having successfully converted two Classic 747s (a -100 and a -200) for



Virgin Atlantic has eight 747-400s in service. AirTeamImages.com/Jan Severijns



United Airlines will fly its last Boeing 747-400 service on November 7.  
United Airlines



Some 747-400s are used in VIP roles, including by the Bahrain Royal Flight which operates a single example. Karl Drage



modify the aircraft, N744VG (formerly G-VWOW). It will have an underwing cradle between the fuselage and inboard engine under the left wing to carry a LauncherOne booster to a launch altitude of 35,000ft. At this height it will be released for a powered ascent to carry payloads of up to 660lb (300kg) into a low orbit. Virgin Orbit, which already has a contract with OneWeb to put 39 small broadband satellites into orbit, plans to make the first LauncherOne flight in 2018.

## LONG MAY SHE REIGN

Like the Classic 747 models before it, the -400 has been eclipsed by more advanced and efficient long-haul airliners. In addition to being outperformed by newer, more cost-

effective aircraft, the 747-400 fleet is becoming increasingly more difficult to maintain. The -400s still in service rely heavily on parts cannibalised from retired/stored airframes, and that supply is drying up.

It was partially this exhaustion of spare parts that led United Airlines to the decision to retire its remaining -400s a year earlier than planned. With only 13 -400s left, providing services to Taipei, Beijing, Frankfurt, Seoul, and London Heathrow from San Francisco, United plans to retire its 747-400 fleet completely before the end of the year, with its last revenue flight currently scheduled for San Francisco to Seoul on October 28. The routes now being serviced by United's 747s will be flown by more fuel-efficient 777-300ERs, which a representative from United

told *Aviation News* will also "provide even more comfort for our customers with features such as the new United Polaris business-class seat".

With United and Delta both divesting their 747 fleets within the next year, British Airways and KLM will remain the two largest operators of the passenger-configured -400s. The -400's future with cargo carriers seems secure for the foreseeable future, with the soon-retiring airliner-configured aircraft potentially available for conversion to freighters.

With 694 total of all variants produced, the 747-400 was by far the most numerous model and the most successful. Though all 747 variants are worthy of the title 'Queen of the Skies', the -400 has reigned supreme. **AN**

A Lufthansa 747-400 on the tarmac at Frankfurt Main. The airline operates 13 examples. Key-Tom Allett







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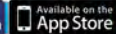
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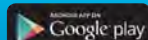
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# PAN AM'S SPECIAL JUMBOS



Pan Am pioneered ultra long-range flights with the Boeing 747SP. **Bob O'Brien** describes how this famous airline made use of this specialised jumbo.

**T**he arrival of the jumbo jet at the end of the 1960s revolutionised commercial air travel. More passengers than ever before could be carried in a single aircraft – the dual-aisled, widebody Boeing 747 dwarfed its predecessors.

Pan American World Airways (Pan Am) was the launch customer, placing orders for 25 with deliveries beginning in 1969. This early involvement saw the airline exert a huge influence on the aircraft's design and development. It is arguable that no carrier since has had the same effect on such a major aerospace project.

Once the 747 was in regular service around the world, it became apparent that the original airframe had many more uses.

In 1973, Pan Am was looking for an aircraft that would enable it to fly non-stop from the USA to Asia and the Middle East.

Lockheed and McDonnell Douglas

Pan Am continued its tradition of using the prefix *Clipper* in the names of its Boeing 747SP fleet. Here is *Clipper High Flyer* in January 1980. Bob O'Brien Collection

tendered for the contract with the L-1011 TriStar and DC-10 respectively, but Pan Am's affinity with the 747 project saw Boeing win out. The two airlines set to work with the design team in Seattle.

## GREATER RANGE

The design that emerged was originally called the 747SB (shortbody), nicknamed 'Sutter's balloon' after the chief 747 design engineer, Joe Sutter. After careful consideration, Boeing changed the designation to SP (standing for Special Performance), reflecting the aircraft's greater range and speed compared with the standard 747-100 series. It was, in effect, a 'chopped down' lighter version of the original, optimised for long flights.

## MAIDEN FLIGHT

Boeing decided to put the 747SP version into production at the beginning of September 1973. Initial expectations for worldwide sales were in the region of between 150 and 200 orders over a ten-year period. Fewer than 50 aircraft would eventually be produced.

Later that same month, Pan Am placed a firm order for ten aircraft valued at \$280m, including spares and options for a further 15, but financial circumstances meant only 11 would eventually enter service (one of which came second-hand from Braniff International).

The first Boeing 747SP-21 rolled off the production line at the Everett facility, Washington state, on May 19, 1975 with the registration N747SP (later to become N530PA).

Boeing's chief test pilot Jack Waddell took the aircraft for a maiden flight of just ►



over three hours on July 4. Such was the success of this first outing that a second, shorter flight was made the same day.

The aircraft was a perfect fit for Pan Am's long-haul requirements, giving the airline the ability to cut costs by standardising on engines and other airframe components that were common to both the 747-100 series and the new 747SP. This also meant the airline could enter markets for which the full-size 747 would not have been suitable.

Mounting financial troubles had seen Pan Am amend its initial contract with Boeing prior to the delivery of the first 747SP, reducing the order to seven airframes with the remaining examples changed to options. Further change was made to the contract on August 1, 1974

their names, following a Pan Am tradition that has echoes of fast sailing ships from the 19th century, built to speed cargo across the oceans.

## CONFIGURATION

Pan Am's first Boeing 747SP, N533PA *Clipper Freedom*, was delivered to the airline on March 5, 1976. After a ceremony at Boeing's Everett facility, the SP made the short flight to Pan Am's terminal at Seattle-Tacoma Airport.

The aircraft itself was something of a celebrity in its own right, having only recently completed a worldwide demonstration tour for the manufacturer, covering 72,152 miles (116,117km).

Powered by four Pratt & Whitney JT9D-7 engines, a total of 233 passengers could

The upper deck was a lounge for First Class customers. It was transformed into a dining area during mealtimes, complete with fine linen and tableware.

Other deliveries quickly followed and the airline was able to start flying the 747SP from Los Angeles International Airport on April 25, 1976. The new non-stop link between Los Angeles and Tokyo was a first for the carrier. Another service for Tokyo departed New York/John F Kennedy International Airport the following day. The flight took 13 hours 30 minutes, shaving three-and-a-half hours off the normal scheduled time, while avoiding the need for a 'technical' stop for fuel in Anchorage, Alaska.

Flight PA 801 departed New York westbound on Mondays, Thursdays and

**The 747SP was a perfect fit for Pan Am's long-haul fleet, allowing the airline to standardise engines and other components with its 747-100 fleet.** Bob O'Brien Collection



when Pan Am agreed terms with Boeing, Northrop Corporation, United Aircraft Corporation and Citicorp Leasing for five 747SPs that were part of the original firm order to be leased from the group for a period of two years, beginning in February 1976.

The SPs all had the prefix Clipper to

be accommodated in a mixed, four-cabin configuration. This included a large First Class area seating a maximum of 47 passengers, a further two cabins known as Clipper Class in the centre, and a Coach section to the rear, which included a galley complex adjacent to the rear bulkhead.

**Clipper Great Republic on approach to London Heathrow Airport in April 1984.**  
AirTeamImages.com/Carl Ford



## PAN AM BOEING 747SP-21 FLEET LIST

Registration	C/n	Name	Currently active
N529PA	c/n 21992	<i>Clipper America</i>	State of Oman as A40-SP
N530PA	c/n 21022	<i>Clipper Mayflower</i>	
N531PA	c/n 21023	<i>Clipper Liberty Bell</i>	
N532PA	c/n 21024	<i>Clipper Constitution</i>	
N533PA	c/n 21025	<i>Clipper Freedom</i>	
N534PA	c/n 21026	<i>Clipper Great Republic</i>	
N536PA	c/n 21441	<i>Clipper Lindbergh</i>	NASA as N747NA
N537PA	c/n 21547	<i>Clipper High Flyer</i>	
N538PA	c/n 21548	<i>Clipper Fleetwing</i>	
N539PA	c/n 21648	<i>Clipper Black Hawk</i>	State of Qatar as VP-BAT
N540PA	c/n 21649	<i>Clipper White Falcon</i>	Las Vegas Sands Corp as VQ-BMS

Notes: N531PA *Clipper Liberty Bell* was renamed *Clipper Freedom*. N533PA *Clipper Freedom* became *Clipper Liberty Bell*. N529PA joined Pan Am in September 1983 from Braniff International.





**The peak utilisation by Pan Am of its 747SP fleet was a high of 17 hours in early 1977.**  
Bob O'Brien Collection



Saturdays, with the return flight PA 800 leaving Tokyo on Wednesdays, Fridays and Sundays. By the following August, the non-stop flights became so popular within the business community that the service was upgraded to daily.

### BICENTENNIAL

The airline pulled out all the stops for the American bicentennial celebrations in 1976 and N533PA was chosen for a special mission to fly from New York to Tokyo via Delhi and return direct to New York within a record-breaking block time of 46 hours. To commemorate the occasion, the aircraft's name was changed from *Clipper Freedom* to *Clipper Liberty Bell*.

In December of the same year, Pan Am began services with the 747SP to the South Pacific. Flight PA815 left San Francisco on Wednesdays and Fridays bound for Auckland, Sydney

and Melbourne on what was the fastest service provided by any carrier between the United States and the region.

More new 747SP services were soon introduced: the 6,605-mile (10,469km) journey from New York to Bahrain was flown direct for the first time with a single weekly flight, and the existing San Francisco to Tokyo flights were complemented by a 7,156-mile (11,516km) route between San Francisco and Hong Kong.

Even in the early years of 747SP operations, Pan Am was keenly aware of its environmental responsibilities, recognising that the more intermediate stops eliminated, the less they would be exposed to criticism from environmentalists and restrictions by governments responsive to ecological concerns throughout their route network.

The 747SP helped the airline match ►







**Pan Am 747SP N533PA at Heathrow in April 1984. The airline operated 11 of this type of jumbo in total.** AirTeamImages.com/Carl Ford

fluctuating demand, such as in winter when passenger loads were smaller an SP could be used rather than a larger -100 or -200 jumbo. The new airliner also opened up business routes that had much less fluctuation than the tourist sectors.

Surveys carried out by the airline indicated that more than 80% of passengers on routes to the Far East were high-paying customers who were prepared to pay a premium for the direct SP flights.

In early 1977, daily utilisation for the 747SP fleet reached a high of 17 hours, compared with 13.7 hours for the standard 747-100s. With the 747SP fleet's costs per aircraft mile slightly higher than those of the Boeing 707-320 fleet, and slightly less than the 747-100 fleet, the management team at Pan Am couldn't help but be happy with their acquisitions.

On February 1, 1979, Pan Am introduced new sleeperette seats in the

First Class cabin (initially on the SPs then rolled out on the rest of its long-haul fleet) on services from New York to Tokyo, Dhahran, and Buenos Aires, and from Los Angeles to Tokyo and Auckland. The new seats offered a 63in (160cm) pitch and the option to recline a full 60° for sleeping – a huge draw for these long flights.

## ERA ENDS

Technological advances meant that 747-100s and -200s could now fly greater distances than ever before, leading to a less intensive long-haul use of the 747SP fleet.

The aircraft could now be found as a gap filler on shorter European sectors, particularly those operating from east coast USA. The 747SP fleet soon saw its days numbered when Pan Am struggled with finances during the mid-1980s.

After selling off its Pacific routes on April 22, 1985 to United Airlines for \$750m, the

airline shed almost a quarter of its network overnight. As part of the deal, the fleet of 747SPs was re-registered and painted into the colours of United Airlines, which was, by this point, one of the biggest airlines in the world.

The sale was not enough to save Pan Am and on December 4, 1991 the airline that had for so long embodied the pioneering spirit of founder Juan Trippe ceased to exist.

Despite the airline's ultimate demise, its experiment with the little jumbo with a large range was one of its notable successes, helping to shrink the globe years before the advent of the Boeing 747-400.

As seen in the fleet list (see panel), some remnants of the Clipper fleet are still in operation today, for example N747NA (formerly N536PA) is in service as a flying observatory for NASA at its Dryden Flight Research Center, California. **AN**

**When Pan Am struggled with its finances in the mid-1980s it sold its Pacific routes to United Airlines – the 747SPs were re-registered and painted in the new owner's colours.** AirTeamImages.com/Carl Ford







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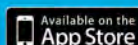
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# 747 FREIGHTERS



Freighters have been an important part of the success story of the Boeing 747. **David Wills** examines the variants and conversions that have taken to the skies.

Over a quarter of the world's in-service widebody freighters are Boeing 747s. In the middle of this year more than 260 747 freighters were in commercial service, comprising 71 -8Fs, 152 subtypes of the -400F/BCF, 35 extended-range -400ERFs, all four Large Cargo Freighters (LCFs) and a single -300SF. In addition, up to a dozen -200F/SFs could be operational.

Freight was integral to the design of the 747. Boeing was one of several firms that conducted studies in the mid-1960s for the USAF's CX-Heavy Logistics System, from which the Lockheed C-5 Galaxy strategic transport was conceived. This work

provided a starting point when Juan Trippe, the legendary President of Pan American World Airways ('Pan Am'), asked Boeing to design an airliner to carry twice the number of passengers of the 707. Boeing allocated Joe Sutter to manage the design team responsible for the new airliner, given the model number 747.

Of concern to Boeing was the possible short sales window for the 747. The age of the supersonic airliner was drawing near; development of the Anglo-French Concorde, the Tupolev Tu-144 and Boeing's own Model 733 (or 2707) was under way. It was feared that as soon as they entered service passengers would view subsonic travel as

passé, and airlines would buy supersonic aircraft. Cargo haulers were happier with the lower running costs of subsonic types, however, and so the 747 was designed for a secondary career as a large freighter. The distinctive shape of the forward fuselage, with the upper deck 'hump' behind the cockpit, created a long, main deck, that could be loaded via an upward-opening nose door or large side entrance.

Juan Trippe, on behalf of his airline, placed an order for 25 747-100s in April 1965, prior to the design being frozen. A site next to Paine Field at Everett, Washington, was acquired in mid-1966, where a huge factory to assemble 747s was built. The prototype rolled out on September 30, 1968, and test pilots Jack Waddell and Brien Wygle, accompanied by Jess Wallick in the flight engineer's seat, took it aloft for its maiden flight on February 9, 1969. Pan Am put the 747-100 into service on January 22, 1970.

In May 1971 the US government ended funding for the 2707, then on its third major configuration. While devastating for Boeing at the time, the 2707's demise secured the future for the 747 as the emphasis shifted from speed to lower costs per seat mile.

None of the 205 747-100s were completed as freighters. The initial version was suited to US domestic operations, but additional range was needed for international routes. Boeing responded by launching the 747-200 in 1968 with a higher maximum take-off weight



A Pan Am Boeing 747-200C is loaded through the nose cargo door. The US airline was integral to the early development of the jumbo, as the launch customer and an operator. Key Collection





One of 14 Boeing 747-8F freighters in service with Cathay Pacific Cargo. Boeing

(MTOW), more powerful engines and longer range. It entered service in February 1971.

## FIRST FREIGHTER

A freighter version, the 747-200F, was offered from the outset, with the nose door and optional side cargo door. A mechanical loading system allowed two people to load 242,800lb (110,132kg) of containerised or palletised cargo within 30 minutes. Up to 29 containers, each 10ft (3.05m) long, 8ft (2.44m) high and 8ft wide could be accommodated in the windowless main deck, and 30 more in the lower holds. Boeing 747-200Fs, and aircraft converted to freighters, retained the under-floor holds of the passenger variants. The hold forward of the wing could, for example, accommodate five 96in x 125in x 64in (2.44m x 3.18m x 1.63m) containers, with an additional four in the aft compartment. Each hold had its own door on the port side of the aircraft, with a third at the rear of the aft hold for up to 800 cu ft (22.6m<sup>3</sup>) of bulk cargo.

The 747-200F could fly 200,000lb (90,718kg) over 5,180 miles (8,336km).

The first freighter flew on November 30, 1971; launch customer Lufthansa Cargo received its initial example on March 9, 1972, going on to order five more singularly, the last on May 27, 1987. Of the 393 -200s built, 73 were freighters for 21 airlines, with Air France and Northwest Airlines (both taking eight), Japan Airlines (seven), Flying Tigers, Lufthansa and Nippon Cargo Airlines (all with six) among major purchasers. The final -200F (for Nippon Cargo Air Lines) was delivered on November 19, 1991.

Boeing began working on a passenger-to-freighter conversion for the 747-100 and -200

in 1972, receiving an initial Supplemental Type Certificate (STC) from the Federal Aviation Administration (FAA) in 1974. The major structural change involved installation of a 10ft 3in (3.12m) high and 11ft 2in (3.40m) wide side cargo door on the port side of the fuselage. Other modifications included removal of all passenger seats and furnishings, strengthening the main deck floor, addition of tie-downs for freight and a two-man cargo handling system. Conversions, known as Special Freighters, lacked the swing nose of production -200Fs, but still carried 29 pallets on the main deck. Aircraft modified from -100s had a maximum structural payload weight of 210,200lb (95,345kg), and -200 conversions 238,900lb (108,363kg).

In 1983 Pan Am agreed to modify 19 of its passenger-configured 747s (15 -100s and four -200s) assigned to the US Civil Reserve Air Fleet (CRAF), with an aft cargo door added and other changes. CRAF aircraft

are made available to the Department of Defense only in times of emergency and the 747s remained the property of Pan Am. The agreement was the first of its kind and the US military designation C-19A was allocated for contractual purposes. The first, Clipper Sea Serpent (N665PA), was redelivered following modification on May 31, 1985, and the last in February 1990.

Special Freighter conversion kits were produced by Boeing at Wichita, Kansas, and conversions were either undertaken there or customers could choose another facility to perform the work. For example, Taikoo (Xiamen) Aircraft Engineering Co (TAECO) based at Gaoqi International Airport in China, completed its first 747-200 conversion in 2000. By early 1985, 25 freighters had been redelivered; this had increased to 90 by 2000, although this also includes modifications to combi (mixed passenger/cargo) configuration.

Boeing was not the only company to ►



Lufthansa's D-ABYE was the carrier's first 747-230F, which was delivered on March 3, 1972.

Key Collection



offer such conversions. Pemco of Florida developed a passenger-to-freighter package for the -100. A 10ft 3in (3.12m) by 11ft 5in (3.48m) cargo door was fitted on the port side aft of the wing; cabin windows were blanked out; an electric cargo handling system installed; a 9g bulkhead added behind the flight deck and the upper deck was reconfigured. The aircraft could carry up to 202,000lb (91,626kg) of cargo. An FAA STC was granted in April 1988 and six completed by April 1991.

Israel Aircraft Industries' (IAI) Bedek Aviation Group also developed a freighter conversion for -200s, at Ben Gurion International Airport, Tel Aviv, redelivering its first to Lufthansa in August 1990. Like other conversions, a main deck cargo door was installed aft of the wing of the port side, while the area around it and the flooring was reinforced, and a powered ball mat/roller cargo handling and restraint system installed. Bedek completed 38 conversions by the end of 2005, returning its final example to Northwest Airlines early in 2006. By then, IAI was working on a similar programme for the -400, for which it had sold out slots until 2009.

Only 81 747-300s were delivered, none as freighters. The most significant change was the Stretched Upper Deck (SUD), increasing the length of the distinctive forward 'bulge' by 23ft 4in (7.11m), more than doubling the number of passengers in that section. Swissair put the first into passenger service on March 28, 1983. The -300 was quickly replaced by the -400 on the production line.

In May 2000 Boeing announced a freighter conversion programme for the -300, following a launch order for three combi-to-freighters from Atlas Air. Based on the -200 Special Freighter, converted -300s had the same internal volume (26,600 cu ft; 753m<sup>3</sup>) as the -200F and could transport 235,000lb (106,594kg) some 4,835 miles (7,781km).

Only six -300 Special Freighters were produced. The first completed in October 2000 went to Atlas Air. It was eventually acquired by TCA of Georgia, which sold it (as EW-465TQ) to Transaviaexport Cargo in May 2016, and is the last -300 in service. Atlas also had a second, while one served with Korean Air. TAECO modified at least two former Singapore Airlines aircraft that were delivered to Dragonair in 2001, while the Hong Kong-based carrier received a third from Boeing in April 2002.



Above: **The side loading door, an option for production freighters, was the main modification for the various passenger-to-freighter conversions. UPS Airlines replaced its 747-100/200 freighters (seen here) with -400Fs in 2008 and 2009 and has ordered 14 747-8Fs.** Key Collection

Below: **Korean Air Cargo operated HL7470 from August 1988, converting it from a combi to a Special Freighter as a 747-3B5(SF) in April 2011.** AirTeamImages.com/Simon Willson



## -400 VARIANT

New technology engines, advanced materials, improved aerodynamics and systems made the 747-400 a significant improvement on earlier variants. In passenger form, it retained the Stretched Upper Deck (SUD) of the -300, had longer, strengthened wings with large winglets, carried more fuel and had carbon brakes. The introduction of a 'glass cockpit' removed the need for a flight engineer.

A freighter variant was planned from the outset. Visible differences included the omission of the cabin windows and the SUD, which would have reduced the height of

the forward main deck by approximately 2ft (0.6m) limiting the types of containers that could be carried. Structural weight was also reduced by 4,410lb (2,000kg) by incorporating advanced materials, raising the payload capability to 249,125lb (113,001kg) which could be flown 5,060 miles (8,143km). The -400F retained the nose cargo door of the -200F, with the option of the port rear side cargo door, to accommodate up to 30 pallets



on the 21,350 cu ft (605m<sup>3</sup>) main deck, which was lined with motor driven rollers. There was 5,600 cu ft (159m<sup>3</sup>) of space in the under-floor cargo hold, in which, for example, 32 LD-1 containers could be stowed. A further 520 cu ft (15m<sup>3</sup>) was available for bulk cargo in another under-floor hold accessed via its own door on the rear fuselage.

Loading time was reduced, thanks to an improved freight handling system.

Prototype 747-428F N6005C rolled out at Everett on March 8, 1993, and first flew on May 4. Certification by the FAA was approved on October 27, 1993, after a brief flight test campaign, building upon that undertaken for the 747-400. Launch customer Air France ordered five in 1989, but never received them, changing its commitment to the combi (400M) version. It was Cargolux of Luxembourg that took delivery of the first -400F (the second built) on November 17, 1993; it also acquired the prototype in September 1995.

In service the -400F demonstrated a 15% lower fuel burn per pound of payload than the -200F. The combination of payload and reduced operating costs, plus a growth in air cargo traffic, helped fuel sales. Boeing produced 126 with its biggest customer, China Airlines, taking 21, followed by Singapore Airlines (17), Cargolux (16), Atlas Air (15), Korean Air and Nippon Cargo Airlines (10 each). A single 747-400F was acquired by the USAF and heavily modified as the YAL-1A Airborne Laser (ABL) with a chemical oxygen



Above: **Production 747 freighters are equipped with a swing nose, allowing direct loading and unloading of cargo.** Key Collection

Below: **The Boeing Converted Freighter programme extended the service life of many 747-400s after their careers in carrying passengers came to an end. Kalitta Air's N743CK originally flew with Japan Airlines.** AirTeamImages.com/Serge Bailleul



IAI's Bedek Aviation Group converted passenger 747-400s into freighters and gave them the designation 747-400BDSF. The longer upper deck of the passenger -400 series was not fitted to production -400Fs. AirTeamImages.com/Jan Severijns

iodine laser occupying the main deck. The ABL project was cancelled in December 2011. The 747-400F was also allocated a US military 'cargo' designation – C-33A – when it was studied as a Non-Developmental Airlift Aircraft to complement the C-17A Globemaster III.

Qantas' commitment for six 747-400ERs launched the programme for this variant on November 28, 2000. Structural modifications and a stronger landing gear allowed a heavier weight of 910,000lb (412,769kg) and more fuel to fly 500 miles (805km) further than the -400. The Australian airline, the only customer, received its first on October 31, 2002. Boeing had quickly identified the improvements would be good for a freighter and announced the -400ERF on April 30, 2001, following an order placed 13 days earlier by International Lease Finance Corporation. Compared with the -400F it could carry 22,000lb (9,979kg) more than 325 miles (525 km) further.

Prototype N5017Q rolled out on September 5, 2002, and completed its maiden flight on September 30. FAA approval was given on October 16 and Air France took delivery of the first the following day. Forty were built for ten customers.

Boeing delivered 694 of the -400 variant, including 166 -400F/ERF freighters. The last new-build -400F was delivered to Nippon Cargo Airlines on May 7, 2009. Delivery of two 747-400ERFs for LoadAir Cargo of Kuwait directly into desert storage on November 10, 2009, concluded -400 production. The latter carrier never started operations and one of the aircraft joined Michigan-based Kalitta Air in 2011 and the other Cargolux in 2013.

In 2000 Boeing began design of a Special Freighter conversion package for the -400, and formally launched the programme in January 2004, following receipt of an initial order for six (plus six options) from Cathay ▶



The most unusual Boeing 747 freighter variant is the Dreamlifter, designed to move components of the 787 Dreamliner. [AirTeamImages.com/Abram Chan](http://AirTeamImages.com/AbramChan)



Pacific. To distinguish it from similar rival projects, it was being marketed as the Boeing Converted Freighter (BCF) by the time the FAA approved the Major Design Change on December 13, 2005.

The 747-400BCF retained the extended upper deck of the passenger variant, although reconfigured as a crew rest area for eight or (optionally) 19 occupants. A freight door, supplied by Mitsubishi Heavy Industries, was installed on the rear of the port side while most of the cabin windows were blanked out. The main deck could accommodate up to 30 pallets, for a total payload capability of 250,000lb (113,398kg), which could be flown 4,700 miles (7,564km).

Boeing chose to outsource conversion of the aircraft to three approved companies. TAEKO was responsible for the initial customer aircraft, which was delivered to Cathay Pacific in December 2005. KAL Aerospace, a division of Korean Air, completed all but one of 20 conversions for that airline at its Gimhae facility. The initial conversions by SIA Engineering of Singapore were four former Singapore Airlines' 747-400s for Dragonair.

In September 2002 IAI also announced the 747-400 Bedek Special Freighter (BDSF) modification programme by its Bedek Aviation Group. In addition to the standard addition of a large freight door, floor strengthening, other adaptations for cargo and reconfiguring the interior of the SUD, the floor beams of the upper deck were removed to allow 10ft (3m) containers on the forward main deck. Up to 253,575lb (115,020kg) could be flown over 4,600 miles (7,400km) by the 747-400BDSF.

IAI predicted a worldwide requirement for 300 converted freighters; it aimed to account for 40%, with a capacity of completing 16 a year. Guggenheim Aviation Partners became the launch customer with two former Air Canada combis becoming full freighters. The first was delivered to Air China Cargo on August 1, 2006. That year Asiana ordered conversions of three combis (plus three options) as freighters, which were redelivered in 2007; an option was firmed and delivered in 2010. The final conversion at Ben Gurion was redelivered in 2012 and at the time was believed to be the last.

Several factors conspired to limit the number of -400 modifications. The global

economic downturn from September 2008 had a significant impact. Rising fuel costs, over capacity, a weakening travel market and a new generation of passenger twins – such as the Boeing 777 and Airbus A330 – meant second-hand 747-400s were available, which for a period boosted freighter conversion replacements of older aircraft. As the dedicated air cargo market diminished and more was transported in the holds of passenger aircraft, older-generation widebody freighters became economic liabilities.

With 747-400Fs entering storage, few carriers would pay to modify old airliners.

Boeing announced the official end of the BCF programme in October 2016. In reality, none had been delivered since the summer of 2012. The BCF and BDSF programmes

involved a total of 81 aircraft, including around 32 in Israel, well short of initial expectations. Surprisingly, in 2016 Asiana firmed up its final BDSF options, the work to convert the combis (already fitted with the side cargo door) to all-freight configuration being cheaper than a used 747-400F. The first was completed in April of this year, by which time the second was being worked on.

When Boeing investigated transporting large sub-sections of its 787 Dreamliner between production sites around the globe, it chose a similar solution to that adopted by its arch rival. Airbus had long employed outsized transporters – Aero Spacelines Super Guppies then A300-600ST Belugas – to move parts around its dispersed facilities. Boeing proposed to do the same with the



**Production 747-400F 'Mega Ark' of Singapore Airlines Cargo. The carrier operates seven -400 freighters.** Key-Dave Allport





Large Cargo Freighter (LCF) conversion of the 747-400.

Evergreen Aviation Technologies of Taoyuan, Taiwan, was contracted to modify four pre-used aircraft. An enlarged upper fuselage section was designed, while Gamesa Aeronautica of Spain developed a hinged swing-tail so that cargo could be loaded from the rear. To retain directional stability, disrupted by the bulged fuselage, the height of the fin was increased by 5ft (1.52m).

The first rolled out on August 17, 2006, and flew on September 9. Boeing conducted the initial mission carrying Dreamliner parts on January 15, 2007, by when the LCF had been christened the Dreamlifter.

On June 2, 2007, Evergreen International Airlines took over the flight operations of the variant from Boeing. All four had been completed by February 2010. After Evergreen went out of business, Atlas Air was awarded the contract in September 2010.

Studies for improved 747s continued throughout the 2000s, with later concepts incorporating technology developed for the Dreamliner. These crystallised around the 747 Advanced, which was formally launched as the 747-8 (-8 from 787) on November 14, 2005. Approximately 70% of structural components differed from the 747-400, including new engines (General Electric GEnx-2B67); higher gross weight and a longer fuselage (by 18ft 4in; 5.6m, to 250ft 2in; 76.25m. It also had a redesigned



**Boeing 747-400ERF (Boeing 747-400ER) VQ-BUU, operated by AirBridgeCargo Airlines, was built in 2006 and was initially flown by Jade Cargo International of China.** AirTeamImages.com/Alex Snow

wing with raked tips in place of winglets giving a larger wingspan. Passenger (747-8 Intercontinental) and freighter (747-8F) versions were designed. The latter retained the earlier variants' nose cargo door and rear port side loading door. It featured a windowless cabin, freight handling systems and a short upper deck compared with the 747-8I. Payload increased to 34 pallets on the main deck. Initial orders were ten for Cargolux, and Nippon Cargo Airlines (eight).

### 747-8F

Prototype 747-8F N747EX rolled out on November 12, 2009, and was flown on February 8, 2010. A 3,400-hour flight test campaign ended with the 747-8F being awarded joint FAA and European Aviation Safety Agency approval on August 19, 2011. Boeing planned the initial delivery to Cargolux

for September 19, 2011, but a contractual dispute between the two delayed acceptance until October 12.

The 747-8F has proved more popular than the 747-8I with 88 orders compared with 47 for the passenger variant. Cathay Pacific and Cargolux currently have the largest fleets, with 14 each. UPS Airlines ordered the same quantity (plus 14 options) in October last year. Sales of new freighters have slowed in recent years. With little interest of late in the 747-8I, Boeing has successively cut the production rate; it currently builds just six jumbos a year and will fulfil existing contracts in 2020, 51 years after Pan Am put the 747 into service.

While the freighter jumbos may not have been in the limelight as much as their passenger carrying counterparts, they have nonetheless proved to be excellent and enduring cargo aircraft. **AN**

## COMBI VARIANTS

Boeing produced several different combi variants of the 747 in addition to the pure freighters. Combi aircraft offer airlines the flexibility to carry purely passengers, freight or a mix of both. In the early days of the 747 carriers struggled to fill the airliner, and combi variants allowed them to fly routes that passenger numbers could not justify. They could also help airlines alleviate problems caused by seasonal peaks and troughs in the passenger and air freight markets by changing the ratio of seating to freight, or reconfiguring the aircraft for one use or the other. In contrast to the passenger configuration, combi versions included a side loading cargo door installed aft of the wing on the port side, a removable bulkhead to separate passengers and cargo on the main deck and some structural strengthening.

Boeing's first variant to combine the two payloads, the 747-200C Convertible, had the nose freight door of the 'true freighter' (a feature lacking in later combi variants), while the side loading door was optional. The 747-200C could be used for all-passenger or cargo operations, or any of five mixed configurations. It first flew on

March 23, 1973 and World Airways received the initial example on April 27 that year. Just 13 were built.

The first 'true' combis were a pair of Sabena 747-129s modified with a side loading door; the initial -129(M) was redelivered to the Belgian airline in February 1974. Production combi variants were the -200M, -300M and -400M, based on corresponding passenger versions, of which 78, 21 and 61 respectively were delivered. On March 7, 1975 Air Canada accepted the first 747-200M. The model proved popular in Europe, with Lufthansa (14), Air France (11) and KLM (7) acquiring the largest fleets direct from the manufacturer, allowing them to fly 747s on routes that passenger numbers alone would have dictated the use of smaller types. As air traffic grew during the 1980s and 1990s, the need for new combi 747s declined as the airline industry increasingly segmented into dedicated passenger or freight operations.

While nearly a fifth of the 747-200s were -200Ms, less than a tenth of total -400 production comprised -400Ms. Today, Boeing does not offer a combi variant of the 747-8.

**Long-time jumbo operator Cargolux has taken delivery of 14 747-8Fs.** Boeing





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Air-Britain produced its original 748 monograph in 1986 and has published this updated version to incorporate the multitude of changes that have taken place since and also cover the British Aerospace ATP development. As well as the military Andover version, the book includes the Hindustan 748 produced under licence in India.

The first section, '748 and Andover', has five chapters, entitled 'General History', 'Technical Description', 'Operators', 'Individual Aircraft Histories' (in great detail even, in most cases, down to numbers of landings and total flying hours) and 'Registration and Constructor's Number Cross References'. The BAe ATP section contains the same five chapter topics but is obviously a lot shorter as this promising type never lived up to its hoped-for sales success.

There is a good selection of photographs, 188 in colour and 90 in black and white showing the often-imaginative schemes of operators. As an additional feature there's a fully searchable CD listing the operator and individual production histories in tabular and linear formats. The result is an indispensable and authoritative book for the air transport enthusiast.

*Published by Air-Britain Publishing: ISBN 9780851304922, available from [www.air-britain.co.uk](http://www.air-britain.co.uk)*

## PHANTOM IN THE COLD WAR – RAF WILDENRATH 1977-1992

### Book

**Written by: David Gledhill**

**Price: £25**

The author provided *Aviation News* readers with a taste of this book in the October issue when we presented an article based on some of the information it contains. It is a supremely interesting account, well written by a former Phantom navigator, which tells the entire story of operating the type in the air defence role over West Germany. RAF Wildenrath's Phantoms were assigned to the fighter engagement zone just behind the surface-to-air missile batteries, and had Warsaw Pact forces invaded they would have fought the opening battles of World War Three.

Chapters include 'The Operational Context', covering Warsaw Pact assets and likely tactics and 'Operating In RAF Germany', detailing the complexity of the airspace and its many restrictions. 'A Day in the Life Of ...' illustrates how everyone on the station from mess stewards to the station commander contributed to the effort, with particular emphasis on the engineering staff.

In one of the concluding chapters, which describes operations in the 1980s and '90s, there is a particularly engrossing account about taking part in Exercise Red Flag over Nevada in 1987. A detachment of Phantom aircrew drew on their knowledge of Soviet tactics and flew alongside aggressor F-5s of the USAF.

As the author observes, the Phantom was undoubtedly the most capable weapon system deployed by NATO in the air defence role until the arrival of F-15s and F-16s. He has done a great job in recalling the tensions of the Cold War from the perspective of a fighter force very much on the front line.

*Published by Pen & Sword Aviation: ISBN 9781526704085, available from [www.pen-and-sword.co.uk](http://www.pen-and-sword.co.uk)*



## INVASION AIRFIELDS THEN AND NOW

### Book

**Edited by: Winston Ramsey**

**Price: £34.95**

Another stellar production from the publisher of *After the Battle* magazine, illustrated with 215 black and white, 115 colour photos as well as 115 maps and plans. Since many of today's comparison scenes would tend to show empty fields, Google Earth imagery has been used with an airfield outlined and in some cases more details added. D-Day planners forecast the number of Advanced Landing Grounds (ALGs) necessary in Normandy to support the allied air forces up to D+90 days. Maps and aerial photos enabled suitable sites to be pinpointed, so that when each was captured British or American engineers could move in and build the necessary infrastructure.



The introduction details the various types of runway and taxiway surface employed, mostly metal tracking, but also hessian impregnated with bitumen. There are many photographs of these being laid. The main content begins with the emergency strips just behind the landing beaches and then, as the allied perimeter widened, the ALGs are described in the order of the date they became operational. To save confusion with unfamiliar French village names, each was allocated a number prefixed by 'A-' for American or 'B-' for British.

Some of the ALGs were in fact permanent aerodromes, examples being Beauvais, Villacoublay and Caen-Carpicquet, but required considerable work to repair surface bomb damage. As well as site plans for most of the locations, there are numerous photographs of RAF and USAAF aircraft on the ALGs, the majority previously unpublished. Many of the sites are marked by memorials which are pictured in this outstanding book.

*Published by Battle of Britain International: ISBN 9781870067911, available from [www.afterthebattle.com](http://www.afterthebattle.com)*

## SKYBIRDS – A PHOTOGRAPHIC ODYSSEY OF THE 353RD FIGHTER GROUP DURING THE SECOND WORLD WAR

### Book

**Written by: Graham Cross**

**Price: £29.95**

A follow-up to the publisher's superlative 2015 volume on the 56th Fighter Group, this edition follows an identical format and presentation while maintaining the very high standards of its predecessor. The 445 monochrome and 48 colour photographs of aircraft, pilots and scenes around the bases and elsewhere are accompanied by very detailed captions. An ongoing narrative introduces 11 of the 14 chapters, the last three covering evaders, escapees and PoWs, air-to-air victories and an Honour Roll of the pilots killed from the 353rd.

The story begins in October 1942 when the unit was created in the US, first with the Curtiss P-40 Warhawk, before operating the Republic P-47 Thunderbolt over Europe. The Skybirds nickname was derived from the Group's initial call sign. After theatre training at Goxhill in Lincolnshire, the unit moved to Metfield, Suffolk in August 1943 where it became operational, later going to Raydon, Essex in April 1944. Conversion to the P-51 Mustang followed in October of that year.

Each of the three squadrons has its own chapter, while another describes the group's ground support units complemented by photographs of the Tiger Moth, Percival Proctor, Airspeed Oxford and other types allocated for liaison and various purposes. Other chapters include 'Markings, Nose Art and 'Famous Aircraft'; 'Accidents, Battle Damage and Crashes' plus 'Off Duty, Rest and Relaxation'. This all adds up to a magnificent book on the distinguished career of a ground attack and bomber escort unit.

*Published by Fighting High Ltd: ISBN 9780993415265 and available from [www.fightinghigh.com](http://www.fightinghigh.com)*







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# NORWEGIAN P-3s

## NORTHERN GUARDIANS



**Lieuwe Hofstra** reports on the Royal Norwegian Air Force's P-3 Orions that patrol the inhospitable waters of NATO's northern flank.

**T**he Royal Norwegian Air Force's P-3 Orions of 333 Skv (Sqn) *Saints* are based at Andøya Air Station, 186 miles (300km) above the Arctic Circle.

From this base, the Orions are able to monitor movements by Russia's Northern Fleet in the Barents Sea, Norwegian Sea and towards the Iceland-Faroes Gap, which gives access to the Atlantic Ocean. Russian naval activity is far from the levels during the height of the Cold War, but the fleet is gradually being modernised with new, quieter, submarines.

Last year the Norwegian government published a defence review which included the intention to buy five P-8A Poseidons as replacements for the ageing P-3s. The report also envisaged the closure of Andøya Air Station and 333 Skv's subsequent move to Evenes.

### THE MISSION

The Royal Norwegian Air Force (RNoAF) became the first European operator of the Orion with the delivery of five P-3B maritime patrol aircraft (MPAs) in 1969. After initial

training in the USA, the first aircraft touched down at Oslo Fornebu Airport on April 10.

Replacing the elderly HU-16B/ASW Albatross, the type brought a giant leap forward in Norwegian anti-submarine warfare (ASW) capabilities.

The P-3s then moved north to Andøya. The location had been chosen during NATO's 1952 conference in Lisbon as suitable for a new airfield to host Norway's ASW component. It would also be home to USAF Air National Guard (ANG) units in case the Cold War turned hot.

Within a year, 333 Skv with its five P-3Bs was declared fully operational, but found it needed more aircraft to patrol the Norwegian Exclusive Economic Zone (EEZ), which was expanded out to 200 miles (322km) in 1977 – so two more Orions were purchased from US Navy stocks, arriving in 1980 and bringing the squadron up to seven aircraft.

At the height of the Cold War, the Norwegians were often the first to encounter new Soviet hardware. One notable incident took place on September 13, 1987 when a brand new Su-27 *Flanker* from the 941st IAP (Istrebitel' nyy Aviatzionnyy Polk/Fighter



Aviation Regiment) from Klip-Yar collided with the outer prop of P-3B s/n 602.

Shrapnel hit the Orion's fuselage, causing a decompression, but both aircraft survived and the P-3B made a safe landing at Banak Air Station.

### UPGRADES

Norway has followed the US Navy when upgrading its Orions – unlike the Canadians who developed their own ASW suite for their CP-140 Aurora version of the aircraft





One of the Royal Norwegian Air Force's four P-3C Orions, it also operates two P-3Ns. All photographs Lieuwe Hofstra



Orion 3297 on the ground at Andøya Air Station.

– and in 1976 the Norwegian P-3Bs were modified at NAS Alameda, Texas, with several components of the US Navy's TAC/NAV modification.

Despite the updates, the P-3Bs were showing their age, and their inability to adequately detect the new, quieter Soviet submarines led to the purchase of four ex-US Navy P-3Cs (163296, 163297, 163298 and 163299) through the Foreign Military sales (FMS) programme.

Five of the seven P-3B Orions were sold to

the Spanish Air Force, with the first delivery in 1989, while between 1990 and 1991 the two remaining P-3Bs (576 and 603) went to US Naval Aviation Depot Jacksonville, Florida, for modification to P-3N (Norway) standard. The 'Ns lack the complete ASW suite of the C-variant, but are fitted with the same flight deck systems and extra passenger seats, and are therefore mostly used for coast guard duties, training and transport. Since their upgrade the serials have changed to 4567 and 6603.

The four P-3Cs arrived between March and July 1989 after additional electronic support measures (ESM) and communications systems had been fitted at NAS Moffett Field California, and at the Naval Air Development Center at Johnsville, Pennsylvania.

Installation of the new ARC-207 HF communication systems, however, led to technical problems that required a completely different aerial system. As such, HF wiring on the Norwegian P-3Cs goes to the top of the tail, unlike other users' P-3Cs. ►



The RNoAF again generally followed the US Navy when it came to upgrading its P-3Cs. The P-3Ns also received some modifications but still don't have a full ASW suite.

Eventually the US Navy launched the P-3C AIP (Anti-surface warfare Improvement Program) which introduced new systems including an advanced imaging system (AIMS) fitted in a FLIR turret below the nose, chaff/flare dispensers, missile warning receivers, the new APS-137 V-5 radar, SATCOM, INS, GPS, an over-the-horizon targeting system (OASIS-III) and a new mission computer (ASQ-212). OASIS was successfully tested by the US Navy during the first Gulf War in 1991.

In common with other Orion users, the RNoAF had its own set of requirements, mainly with ESM, while weapons for its P-3s include depth charges,

torpedoes, free-fall bombs and mines which can be carried in an internal bomb-bay. Hardpoints under the wings can also be used for ordnance.

Keeping the ASW suite up-to-date is one thing – maintaining the airframes in mint condition poses other challenges, and Andøya's location above the Arctic Circle, bordering the Atlantic Ocean, means the aircraft are subject to some of the harshest conditions in the world. Keeping the runway free from snow and ice is sometimes

impossible and so sand will be sprayed across the airfield. This can damage paint when reverse thrust is applied.

New Zealand started to re-wing its ageing P-3s in the late 1990s. It operated early models and has a large EEZ to patrol as well. Its

***'Andøya's location above the Arctic Circle, bordering the Atlantic Ocean, means the aircraft are subject to some of the harshest conditions in the world'***



Norwegian Orions often participate in the Joint Warrior exercises, as here, that take place in the UK.



One of the two P-3Ns that are used for coastguard, training and transport duties.







Two Norwegian Orions fly in formation during this year's airshow at Andøya.

P-3s were the first to encounter fatigue and corrosion issues, and manufacturer Lockheed Martin followed the Kiwis' example and offered re-winging to other customers.

In 2007, the Norwegian government placed an order for six new wing sets. The new production wings were the cornerstone of the manufacturer's Aircraft Service Life Extension Program (ASLEP).

The project replaces the outer wings, centre-wing lower surface assembly, horizontal stabiliser, wing and horizontal stabiliser leading edges and various fillet fairings. All necessary fatigue life-limiting structures are replaced, leading to significantly reduced maintenance and sustainment costs, and new alloys employed, providing a fivefold increase in corrosion resistance.

When put through ASLEP, the Norwegian P-3Cs had an average of 14,000 hours on the clock. The much older P-3Ns, at the respectable

age of 45 years, had already passed an average of 20,000 hours. The P-3Ns are lighter than the 'Cs (due to them not having the complete ASW suite) and therefore suffer less from fatigue and stress on the airframes. The new wings should give the Orions at least another 15,000 hours' life.

IMP Aerospace & Defence in Halifax, Canada, carried out the ASLEP, which took about 12 to 14 months for each airframe. Parallel to the improvements, Lockheed Martin announced the aircraft were to be fitted with new avionics. The first airframe to go through this process was 6603.

Norway received six life-extension kits and engineering support under the contract. More recently, it's signed a joint contract with the German Navy covering maintenance and spare parts. This is a logical decision as the Germans say they will continue operating the Orion for at least another decade. Lockheed Martin will supply the parts and maintenance will be carried out at the EADS facility in Manching, Germany.

The Norwegian P-3s often take part in the twice yearly Joint Warrior exercise that take ▶



All the Norwegian Orions have always had nicknames. Aircraft 3297 is called *Jøssing* – a word that came to mean a Norwegian patriot, after the British destroyer, HMS Cossack, raided the German tanker *Altmark* in the Jøssingfjorden in 1940, freeing numerous POWs.







Above: **Flares are deployed during a simulated attack run by Orion 3296.**

Below: **Norway's 333 Skv is known as the Saints and which appears as a symbol on the aircrafts' tails.**

place in the UK with maritime patrol aircraft deploying to RAF Lossiemouth, Moray. For example, the unit participated in the edition of the exercise taking place in October. The squadron's commander told *Aviation News*: "The NATO MPA community is small-knit. Sharing experience is important. For that reason we visited Spanish P-3 colleagues at Morón in 2017, and it's a relief to see they encounter the same issues as we do – and sometimes we have figured ways out to deal with it, sometimes they did."

The week before an air show on June 24 celebrating 75 years of 333 Skv and 60 years of Andøya Air Station, an ASW competition was held with German P-3, Canadian CP-140, French Atlantic and US Navy P-8 crews. The commanding officer said: "These kind of exercises are good for experience and morale."

## THE FUTURE

The future of Norway's armed forces, outlined last year, is set against worsening relations between NATO and Russia.

Meanwhile, although maintenance

contracts had been signed with the Germans, the Norwegian government announced the P-3s and two Falcon 20s are to be replaced by five P-8A Poseidons. The type is due to enter service in 2020.

Andøya Air Station is due to be closed once the P-3 operations wind down: the five P-8s are to be based at Evenes Air Station together with a F-35 QRA detachment.

The 333 Skv commander says that after initial training in the US, future P-8 crews would be trained at Evenes. As the Poseidon force builds up at Evenes the P-3 crews will continue to conduct their missions from Andøya, effectively splitting the squadron in two.

Agreements on P-8 training, maintenance and spare parts have recently been signed with the US Navy and the RAF, which has also ordered the P-8. Among the weapons slated for 333 Skv's Poseidons is the Naval Strike Missile from Norwegian company Kongsberg.

The P-3 Orion has served the Royal Norwegian Air Force well and the P-8 Poseidon has a hard act to follow in what is a challenging environment. **AN**





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# AIR BASE MOVEMENTS

A selection of the most interesting aircraft to visit air bases in the UK recently.



**RAF Coningsby** played host to detachments of Tornados and EF2000s from the German Air Force for Exercise Cobra Warrior which ran from September 11 to 28. Peter R Foster

## RAF BRIZE NORTON.

1/8 08-0050 & 11-0061 CV-22Bs 7th SOS, 352nd SOW, USAF. 3/8 ZZ664 RC-135W 51 Sqn, RAF Waddington diversion. 4/8 ZZ511 Wildcat AH1 AAC. 7/8 5607 C-130J-30 335 Skv, Royal Norwegian AF. 8/8 54+09 A400M LTG62, German AF n/s; 51+01 Transall LTG61, German AF n/s; 053 Falcon 20ECM 717 Skv, Royal Norwegian AF. 14/8 54+01 A400M LTG62, German AF o/s. 15/8 54+01 A400M LTG62, German AF. 21/8 **EZ-F426 II-76TD Turkmenistan Airlines n/s also 30th n/s.** 22/10 ZJ126/K & ZJ137/W Merlin HC3is 846 NAS, RN; CH-10 C-130H Belgian Defence – Air Component. **23/8 A41-210 C-17A 36 Sqn, RAAF dep 25th.** 24/8 E20 & E163 Alpha Jet Es EAC00.314, French AF both o/s. 26/8 98-6006 C-32B USAF dep 2/9. **31/8 13-5778 MC-130J 67th SOS, 352nd SOW, USAF o/s.**

## RAF CONINGSBY

6/8 064/YY Xingu EAT00.319, French AF. 9/8 ZJ232 Apache AH1 3/4 Regts, AAC. 21/8 ZJ189 Apache AH1 4 Regt, AAC o/s. 23/8 E163/705-RB Alpha Jet E EAC00.314, French AF. 30/8 50+40 Transall LTG61, German AF; ZA559/049 Tornado GR4 dep to Leeming for RTP; ZK361 Typhoon FGR4 arrived on delivery from Warton. 31/8 ZZ375 Wildcat AH1 847 NAS, RN.

## RAF FAIRFORD

21/8 07-1789 C-17A 437th/315th AW, USAF n/s; 05-5143 C-17A 89th AS, 445th AW, AFRC. 22/8 79-1711 KC-10A 305th/514th AMW n/s. 23/8 **86-0142/DY & 85-0087/DY B-1Bs 9th BS, 7th BW, USAF; 60-0003/BD B-52H 93rd BS, 307th BW, USAF;** 80-1083 U-2S 99th RS, 9th RW, USAF dep. 13th.



**Boeing B-52H Stratofortress 61-0020/LA The Big Stick** from the 20th BS, 2nd BW at Barksdale AFB exits the runway at RAF Fairford on September 22. It was one of three B-52Hs that arrived on September 14 and during their stay took part in the French-run exercise Serpentex 2017. A US European Command press release said they were present to: "conduct theatre integration, flying training, and joint and allied training to improve bomber interoperability." The bombers left for home on September 29. Aaron Paxton / Aviation In Action

1/9 61-0029/BD 93rd BS, 307th BW, USAF, the B-52Hs and B-1Bs departed on September 12.

## RAF LAKENHEATH

1/8 16-0055 A400M 221 Filo, Turkish AF departed after arriving on July 31. 2/8 63-13187 C-130E 222 Filo, Turkish AF dep; 88-2102 HC-130N 102nd RQS, NY ANG also 4th; 02 C-17A SAC dep 4th. 3/8 62-4138 RC-135W 55th Wg, USAF n/s. 4/8 08-0050 CV-22B 7th SOS, 352nd SOW, USAF. 9/8 08-8604/RS C-130J-30 37th AS, 86th AW, USAF also 11th. 10/9 FB-20 F-16BM 10 Wing, Belgian Defence – Air Component. 11/9 15-0051 A400M 221 Filo, Turkish AF dep 14th. 14/9 **12-1007, 12-1011, 12-1016, 12-1031, 12-1037 & 12-1038 F-15SAs Royal Saudi AF on delivery all dep 17th.** 23/8 11-5738 C-130J-30 19th AW, USAF; **86-0148/FL F-15C 159th FS, FI ANG & 81-0041/JZ F-15C 122nd FS, La ANG both dep 1/9; 86-0155/FL F-15C 159th FS, FI ANG & 83-0036/JZ F-15C 122nd FS, La ANG both dep 26th.** 29/8 **07 blue C-27J TE, Lithuanian AF.**

## RAF LEEMING

4/8 ZZ511 Wildcat AH1 AAC; 08-0050 CV-22B 7th SOS, 352nd SOW, USAF. 29/8 ZA369/003 Tornado GR4 arrived for RTP. 30/8 ZA559/049 Tornado GR4 arrived for RTP. 29/8 12-0064 CV-22B 7th SOS, 352nd SOW, USAF.

## WATERLOO BARRACKS, LEUCHARS

29/8 C-FARA Skyvan arrived from Brize Norton for para drops. 29/8 12-0064 CV-22B 7th SOS, 352nd SOW, USAF.

## RAF LOSSIEMOUTH

5/8 166783/AJ-107 F/A-18E VFA-31, USN o/s; **166639/AJ-213 & 166683/AJ-205 F/A-18Fs VFA-213, USN both o/s.** 8/8 ZZ532 Wildcat HMA2 815 NAS, RN; 167892/AJ-622 & 167878/AJ-611 MH-60S HSC-9, USN. 10/8 168440 P-8A VP-16, USN; 166557/NW-603 MH-60R HSM-60, USN. **19/8 140104 CP-140 RCAF dep 29th.** 21/8 130606 CC-130J 436 Sqn, RCAF. 25/8 177701 CC-177 437 Sqn, RCAF dep 27th. 30/8 T-729 Beech 1900D LTDB, Swiss AF n/s; 06-6164 C-17A 62nd/446th AW, USAF n/s.

## RAF MARHAM

**18/8 760 Tornado Royal Saudi AF o/s.**

## RAF MILDENHALL

1/8 08-6201 MC-130J 9th SOS, 27th SOW, USAF dep 3rd; 900530 C-26D AOD Sigonella n/s; ZZ333 Voyager KC3 10/101 Sqn, RAF. 2/8 60-0333 KC-135R arrived for 100th ARW as replacement for 61-0267; 88-2102 HC-130N 102nd RQS, NY ANG dep 4th; 169036 C-40A USN also 8th & 9th. 3/8 **162168/45 C-2A VRC-40, USN dep 10th;** 165093 C-20G USN also 6th, 7th & 10th. 4/8 **162159/46 C-2A VRC-40, USN dep 10th.** 7/8 99-0003 C-32A 89th AW, USAF o/s; 15-0051 A400M 221 Filo, Turkish AF n/s. 10/8 168440 P-8A USN. 11/8 168581/AJ-620 MH-60S HSC-9, USN. 12/8 86-0025 C-5M 436th/512nd AW, USAF. 14/8 165832 C-40A USN n/s. 17/8 44+65 Tornado IDS & 46+52 Tornado ECR TLW651, German AF both o/s. 23/8 E28/705-AB, E207/705-MS & E163/705-RB Alpha Jet Es AJeTS, French AF all n/s. 24/8 85-0001 C-5M 436th/512nd AW, USAF n/s. 25/8 **81-0039/JZ F-15C 122nd FS, La ANG n/s; 86-0162 F-15C 159th FS, FI ANG n/s.** 31/8 LX-N90459 E-3A NAEWF o/s.

## RAF NORTHOLT

2/8 84-00488 & 10-00260 C-12Vs E/1-214th Avn, US Army. 21/8 ZJ961 Sentinel R1 5(AC) Sqn, RAF. **25/8 ZZ516 Wildcat HMA2 815/825 NAS, RN.** 29/8 253 CN-235MP 101 Sqn, Irish Air Corps. 30/8 93/XL TBM 700A EC00.060, French AF n/s; ZM408 Atlas C1 70 Sqn, RAF n/s. 31/8 018 C-295M 13.eltr, Polish AF.

## ALLANBROOK BARRACKS, TOPCLIFFE

29/8 M-512 & M-517 EH-101 Mk.512 Esk 722, Royal Danish AF.

Key: n/s night stop; o/s overshoot



# AIRPORT MOVEMENTS

A round-up of notable aircraft visiting UK airports.



## ABERDEEN

**1/7** F-GRGG ERJ 145EP on delivery to BMI, dep 5th as G-CKAG. **2/7** OY-RUE MD-83 Danish Air Transport; SE-DSX RJ100 Malmo Aviation; D-IAKN CitationJet 525A CJ2; EC-MFS 737-4Y0 AlbaStar. **6/7** F-GSGL CitationJet 525B CJ3. **7/7** D-CEFE CitationJet 525C CJ4. **9/7** EC-LTG 737-4K5 AlbaStar; D-ISKY Beech 200. **10/7** S5-ACJ ERJ 145LU Aero4M; YR-FKA Fokker 100 Carpatair. **12/7** F-HRGD ERJ 145LU Regourd Aviation. **17/7** OK-SFA Beech 400XP; 9H-MTF 737-329 Multiflight. **19/7** D-CTWO Learjet 35A. **20/7** N757AF 757-2J4ER DJT Operations. **21/7** D-IJET Avanti. **26/7** 5B-DDC A320-232 Cobalt Air also 28th; N1TF Gulfstream G650. **27/7** OO-NSN AW 139 NHV. **29/7** G-EMEA H175 CHC helicopters on delivery. **30/7** OK-KIN CitationJet 525B CJ3.

**2/8** CS-TFU A319-115LR White. **5/8** OY-MLS P.68B on survey work until 16th. **6/8** G-OENC AW189 Bristow Helicopters on delivery. **7/8** D-CASH Phenom 300. **8/8** PH-NHU H175 NHV. **10/8** **SP-TBM TBM 930**. **11/8** EC-KRN Gulfstream G200; OK-PAR CitationJet 525B CJ3 also 17th. **15/8** 144614 CC-144B 412 TS, RCAF. **16/8** **N238PT DHC-4A Caribou Pen Turbo Aviation**. **20/8** EC-MLA Falcon 2000S; N504AC Gulfstream G550. **26/8** N813PD Gulfstream IV. **28/8** OO-LMS Falcon 900LX. **29/8** OO-NHT EC155B1 NHV. **31/8** ZM408 Atlas C1 70 Sqn, RAF.

## BELFAST INTERNATIONAL

**5/6** N221GA Gulfstream G280 on delivery. **6/6** EC-MEO BAe 146-300QT ASL Airlines; 99-0402 C-37A 76th AS, 86th AW, USAF; 92-1534 & 92-1531 C-130Hs 187th AS, Wy ANG both n/s; 165829 C-40A VR-58, USN dep 8th. **7/6** YL-RAH Saab 340A/F RAF-Avia; 84-0906 C-21A 76th AS, 86th AW, USAF; 165152 C-20G VR-51, USN. **8/6** 89-9102 & 94-6706 C-130Hs 165th AS, Ky ANG; 165833 C-40A VR-58, USN. **9/6** 169036 C-40A VR-61, USN n/s; 9H-ALJ Falcon 900EX also 12th; N123CA Do.28A-1; 164996

**Tupolev Tu-204-300A, RA-64010 at London Luton Airport on September 22.** Paul K Ferry/ Apron Media

C-130T VR-64, USN n/s. **10/6** 79-0479 & 82-0056 C-130Hs 192nd AS, Nv ANG both n/s; 165158 C-130T dep VR-54, USN 12th. **11/6** 166695 C-40A VR-56, USN; 165829 C-40A VR-58, USN n/s; 165833 C-40A VR-59, USN; D-BUZZ Citation 750 X; 165378 C-130T VR-64, USN n/s. **12/6** C-GWFK Falcon 50EX dep 14th also 17th n/s. **14/6** D-BEAR Citation 750 X dep 16th; 90-0030 C-20H 76th AS, 86th AW, USAF n/s. **15/6** OO-TFC 757-222/PCF ASL Airlines op for TNT; C-FXHC CRJ200LR Voyager Airways; 84-0087 C-21A 76th AS, 86th AW, USAF. **16/6** N737AG BBJ1; 01-1461 C-130J-30 115th AS, Ca ANG also 26th. **17/6** 165159 C-130T VR-64, USN also 19th. **20/6** VP-CPX PC-12 also 22nd; 92-1538 C-130H 187th AS, Wy ANG, n/s also 22nd. **21/6** 06-0500 C-37B 89th AW, USAF also 22nd-25th; 163514 C-130T VR-62, USN n/s. **22/6** 165378 C-130T VR-64, USN dep 24th. **23/6** OY-CLP Citation 650 VII; OK-UGJ Citation 680 Sovereign; 166696 C-40A VR-56, USN n/s. **24/6** 99-0402 C-37A 76th AS, 86th AW, USAF n/s. **25/6** 96-1007 C-130H 109th AS, Mn ANG n/s; 95-6712 C-130H 130th AS, WV ANG. **27/6** EI-PRO & EI-LOW AS355Ns; F-HRAV ERJ 145LU Regourd Aviation dep 29th; 96-7323 C-130H 302nd AW, AFRC n/s; 96-1008 C-130H 109th AS, Mn ANG n/s. **28/6** YL-RAE Saab 340B/F RAF-Avia n/s; 96-7324 C-130H 302nd AW, AFRC; 165378 C-130T VR-64, USN n/s; 96-1005 C-130H 109th AS, Mn ANG n/s; 96-7322 C-130H 302nd AW, AFRC n/s. **30/6** SE-RHD Citation 560XLS+.

## BIRMINGHAM

**1/8** EZ-A778 777-22KLR Turkmenistan Airlines. **2/8** S5-AAY CRJ900 Adria Airlines f/v; D-CFFF Citation 560XLS+. **3/8** UR-CAJ An-12BK Meridiana; CS-DVY Legacy 600; I-TOPX Hawker 400XP. **4/8** 2-LIFE Eclipse EA.500 also 16th; C-GFLU Falcon 900DX; F-HELA ERJ 145EU Enhance Aero Maintenance

also 6th. **5/8** D-AFAC Challenger 604. **8/8** OK-PPP Nextant 400XTI; SE-RCM Citation 560XLS. **11/8** EC-LMR BAe 146-300QT ASL Airlines. **12/8** OE-GPS Citation 550 Bravo. **16/8** F-GIII PA-31T Cheyenne 2; OK-HWK Hawker 900XP. **17/8** UR-CNT An-12BK Ukraine Air Alliance; D-CBTA CitationJet 525C CJ4 also 31st; HB-JSF Challenger 650 also 31st. **19/8** 9H-JPC Legacy 600; CS-DVH CitationJet 525B CJ3; D-CHIC Phenom 300. **20/8** PH-HRK Avanti. **21/8** N330LC Cessna P.337H. **22/8** F-GVZJ ATR 42-320 Equallight Services f/v; ZZ336 Voyager KC3 10/101 Sqn, RAF f/v. **24/8** UR-CZZ An-12BP Ukraine Air Alliance; F-HLPN Falcon 2000EX; N150GV Gulfstream G150. **25/8** SE-KPO Saab 340A SprintAir; VQ-BSP Falcon 7X; T7-SKA Global XRS. **26/8** F-HBXM E170LR Hop!; **YU-TPC Citation 500 1**; D-CFIV Learjet 35A. **27/8** VT-ANY 787-8 Air India f/v. **28/8** F-HTAG 757-256 f/v, La Compagnie to MAEL; T-785 Falcon 900EX LTDB, Swiss AF; VP-BOK Global 6000. **30/8** ZS-NEX 767-35DER Aeronexus; LZ-TRH Learjet 60.

## BLACKPOOL

**1/6** D-CEFD CitationJet 525B CJ3. **3/6** PH-VVV CzAW SportCruiser n/s. **7/6** **EC-IOD P-68C dep 15th also 7-16/7**. **10/6** SE-DJG Legacy 600. **12/6** D-CELI Citation 550 Bravo; EI-DMG Cessna 441; YU-HEV SA342J Gazelle. **16/6** F-HARI Cessna 172S. **19/6** YU-SPB Citation 560XLS. **20/6** PH-746 Grob G-109B n/s. **21/6** D-CFOR Learjet 35A. **22/6** LN-OBX AS332C1 AS Airlift n/s also 24th; N721EE Legacy 500 dep 24th. **29/6** **OE-XDT Robinson R-44 dep 2/7**.

## BRISTOL INTERNATIONAL

**1/7** D-CHGS Phenom 300 also 2nd; D-IOHL CitationJet 525A CJ2. **2/7** SE-RIL Citation 560XLS. **3/7** OK-EAS Nextant 400XT. **7/7** D-CEFE CitationJet 525C CJ4; D-ELIC Cessna 182RG; SP-SPE ATR 72-202 SprintAir dep 12th. **12/7** LX-JFC PC-12 n/s. **13/7** LZ-TRH Learjet 60; N835BA BBJ1. **14/7** HB-JUF Gulfstream G650 also 24th. **19/7** D-ITRA CitationJet 525 CJ1. **22/7** D-CAGA Phenom 300. **24/7** SE-RCM Citation 560XLS. **25/7** D-IBJJ CitationJet 525A CJ2. **26/7** D-BEEP Citation 750 X. **28/7** EC-LXV 737-85P Air Europa f/v; **HA-CIM TBM 700 n/s**. **30/7** D-CEIS Citation 680 Sovereign. **31/7** D-BEAR Citation 750 X.

## CAMBRIDGE

**1/7** M-DSKY TBM 930; VP-BRA Falcon 2000LX; OE-IBZ 737-34S/BDSF TNT Airways. **2/7** YU-BTN CitationJet 525B CJ3. **3/7** C-FFBC Challenger 350;





VQ-BSF Falcon 7X. 4/7 I-NHCO Falcon 2000LX; D-CINS Learjet 45. 6/7 N1F Gulfstream G650. 7/7 OO-TRJ Cessna F.172P; OO-KPA Cessna 172R; OO-LVA Cessna 172S; D-EPJO Cirrus SR-20; OY-NLA CitationJet 525B CJ3; LX-AVD Diamond DA-40; PH-RAC & PH-RAD Diamond DA-40Ds; D-GOEL Diamond DA-42NG-IV; D-EWAP Extra EA.300; D-EPMA & HB-DIE Mooney M.20Ms; HB-POF PA-28-161; D-EDBG, F-HIFI & HB-PBV PA-28-181s; LX-AVG PA-28-236; HB-PGF PA28RT-201T; HB-YHM Pulsar XP; F-GJQU & F-GYJR Robin DR.400/140Bs; F-GSZC Socata TB-10; OY-IPA Van's RV-6A. 9/7 D-ESSO Mooney M.20M. 12/7 EI-DMG Cessna 441. 14/7 HB-JRB Challenger 604. 14/7 CS-EFG Falcon 7X. 15/7 OO-TNL 737-34S/F TNT Airways; OO-RAH Beech 400XP; EC-MHR BAe 146-300QT ASL Airlines; D-AAAY Challenger 604.

## DURHAM TEES VALLEY

1/7 N755JG TBM 900 n/s. 5/7 M-ISTY Gulfstream G280. 7/7 N288Z Gulfstream G650 n/s. 11/7 ZM414 Atlas C1 70 Sqn, RAF o/s. 15/7 D-CSOS Learjet 45 n/s. 17/7 D-ISAV Cessna 402B. 18/7 D-CFIV Learjet 35A. 21/7 EI-SLH ATR 72-215/F ASL Airlines arrived for parting out. 22/7 D-CASH Phenom 300 n/s. 24/7 OO-NEY Legacy 450 type f/v. 30/7 2-LAND Commander 114B. 41/7 T-785 Falcon 900EX LTDB, Swiss AF.

## EXETER

1/7 9H-ZAZ 737-436 Air Horizont; N912GG Gulfstream G650ER. 2/7 9H-WFC Legacy 600. 6/7 XA-CHD Falcon 2000LX; QQ102 RJ70 QinetiQ training. 7/7 S5-AAP A319-132 Adria Airways. 9/7 EC-LTG 737-4K5 AlbaStar. 10/7 D-ASBG Falcon 900EX. 11/7 **OK-STL Cirrus SR-22**. 14/7 LX-ONE Learjet 45; CS-DTC Phenom 100; OM-NAS 737-86J AlbaStar. 15/7 EC-KKQ ATR 72-500 Swiftair op for Eastern Airways. 19/7 N912GG Gulfstream G650ER. 20/7 OO-PCJ PC-12; I-EDLO Hawker 750. 21/7 OE-LTK E170LR People's Viennaline. 22/7 F-HCTB Diamond DA-42. 23/7 LX-JFZ PC-12. 26/7 ZM415 Atlas C1 70 Sqn, RAF. 28/7 SE-RMO Learjet 45. 30/7 LX-JFQ PC-12.

Flybe Aviation Services

16/7 G-OTIF BAe 146-200 BAE Systems. 19/7 **5Y-QHW Dash 8-Q402 Jambo Jet depart.**

## GUERNSEY

1/6 9H-IRA Global Express for storage pending sale; 9H-DDJ Learjet 75 also 5th; D-EAKE Cessna F.177RG; F-GSSD Cirrus SR-20. 2/6 D-GCOB Diamond DA-42. 5/6 D-CPRS Beech 350. 6/6 HB-FOW PC-12. 7/6 HB-VMX Citation 550 Bravo. 9/6 D-EEVB Cessna F.172M; 888/MCB PC-6/ B2-H4 ETCM, French Army. 10/6 LX-LCO Cessna P.210N. 11/6 9A-JIM CitationJet 525 CJ1 also 25th; D-EGSD Mooney M.20R; F-GHBQ PA-28-181. 13/6 F-GRNT Merlin 3B Airlec Air Espace; D-FSJP TBM 700; F-BVOL PA-28-181; 2-FPLF Beech 350 for storage pending sale. 15/6 OY-NDP CitationJet 525A CJ2+; F-GNSJ Beech 58. 16/6 D-GUFI PA-34-220T; D-EBCM Cirrus SR-22. 17/6 HB-JOB Falcon 7X; F-HARI Cessna 172S; 2-ANLD PA-34-220T. 19/6 D-IAAT Phenom 100. 20/6 F-HTIO Beech 200GT; F-PAPS Van's RV-6. 21/6 G-BEVT Trislander final departure of type to Duxford; HB-YND GlaStar GS-1. 22/6 D-AOLG Fokker 100 Avanti Air; OO-HBU Cessna F.172N; OO-TWA PA-28-181. 23/6 EC-LYL Citation 560XLS+; D-CDAS Phenom 300 also 27th. 26/6



**Turweston Aerodrome in Northamptonshire played host to Pilatus PC-12/47E, OY-RSE, on September 24.** Clive Glaister

D-CAAL Do.228-202 Arcus Air, on lease to Aurigny; F-HFSD Falcon 8X. 27/6 F-GJZQ & F-GORH Robin DR.400/140B. 29/6 F-HBTV Citation 525 M2. 30/6 F-GJFN Beech F.33A; D-EFGU, D-EWCD & PH-PPG Cirrus SR-20s; **4X-CWS**, D-EBZV & D-ERBD Cirrus SR-22s; D-EAPE, D-EFBS OE-DES Cirrus SR-22Ts. .

## LIVERPOOL

3/7 LN-RTN Falcon 2000LX n/s; **UR-GRG Diamond DA-42MPP also 10th.** 7/7 CS-DVS Phenom 100; N716AS Gulfstream V dep 10th, also 16th-25th; **S5-CMM Citation 501 1/SP n/s.** 10/7 LN-SOV Citation 680 Sovereign; ZS-NEX 767-35DER Aeronexus also 14th. 15/7 N800PM Gulfstream V dep 21st. 17/7 HB-WYT Remos GX; N795HG Citation 750 X dep 19th. 18/7 PH-TFF 737-86N TUI Netherlands; D-CAWS Citation 680 Sovereign; N205FP Challenger 300 dep 21st. 21/7 9H-FAM Phenom 100; PP-OSM Falcon 7X dep 23rd; XA-ARK Challenger 604 dep 24th; N797KK Global XRS dep 23rd. 22/7 HB-JFX Global 6000 n/s; C-GZPX Challenger 604 dep 24th. 23/7 OE-KKG Mooney M.20P. 24/7 F-HBFP Hawker 800XP; OK-UNI Citation 680 Sovereign also 25th; F-HBMR Citation 550 II. 25/7 SX-RFA 757-23N Gainjet. 26/7 **OM-BYO Tu-154M Slovakian Government.** 28/7 OO-FPF CitationJet 525B CJ3+; D-IKOE Citation 510 Mustang. 29/7 ES-AVG CRJ900LR Nordica.

## LONDON GATWICK

2/8 CS-TNY A320-214 TAP Air Portugal f/v; N881XA 737-86J Xtra Airways ops for Norwegian. 3/8 C-GEOU 767-375ER Air Canada Rouge f/v. 6/8 EC-MPG 737-800 Air Europa f/v. 9/8 N407TR Gulfstream G550 f/v. 10/8 MAC C-17A Qatar Emiri Air Force f/v. 12/8 TC-JOK A330-343E Turkish Airlines f/v. 13/8 EC-MPS 737-800 Air Europa f/v. 16/8 YL-CSG CS300 Air Baltic f/v. 19/8 TF-SKY A321-253N WOW Air f/v. 22/8 LY-GTW 737-4Q8 Getjet op for Norwegian f/v; SP-ENO 737-8AS Enter Air f/v; TC-JNM A330-343 Turkish Airlines f/v. 24/8 C-GDUZ 767-38EER Air

Canada Rouge f/v. 26/8 B-LRR A350-941 Cathay Pacific f/v. 29/8 TC-LOE A330-343E Turkish Airlines f/v. 30/8 TC-LND A330-303 Turkish Airlines f/v. 31/8 C-GUBC A330-243 Air Transat f/v; SX-MAI 737-4K5 Air Mediterranean op for Meridiana f/v.

## LONDON HEATHROW

1/8 EP-IJA A330-243 Iran Air f/v. 2/8 SU-GEK 737-800 Egyptair f/v. 4/8 B-1429 777-300ER Air China f/v. 5/8 AP-BMS 777-3Q8ER PIA f/v. 6/8 EI-GAL A320-214 Aer Lingus f/v. 9/8 D-AINF A320-271N Lufthansa f/v. 10/8 OH-LTS A350-302E Finnair f/v. 11/8 PT-MOE 767-316ER LATAM f/v. 14/8 PT-MOF 767-316ER LATAM f/v. 15/8 A7-ADH A320-232 Qatar Airways f/v; PH-EXK E175STD KLM f/v. 16/8 A7-LAD A320-214(SL) Qatar Airways f/v. 17/8 A7-ADJ A320-232 Qatar Airways f/v; D-ABDP A320-214 Eurowings f/v; SE-ROA A320-251N SAS f/v. 19/8 A7-AFJ A330-243F Qatar Airways f/v. 20/8 N828AA 787-9 American Airlines f/v. 24/8 DU-141 AW139 Dubai Air Wing f/v. 25/8 B-8383 A330-343E Air China f/v; LZ-EAA A320-231 Electra op for Bulgaria Air f/v; VP-BMI 737-8MC Aeroflot f/v.

## LONDON LUTON

2/8 OE-ITE Gulfstream G450. 4/8 N312ZW Gulfstream G650ER. 5/8 OY-RUR ATR 72-201 Danish Air Transport; B-8253 Gulfstream G450. 6/8 PH-DAM Avanti II. 8/8 N480CH BBJ1. 10/8 D-IAAR Phenom 100; 9H-GPS Citation 560XL. 12/8 D-CSOS Learjet 45; C-FEDG Challenger 350. 13/8 T7-AOO Challenger 605. 14/8 0001 Gulfstream G550 1 BLT, Polish AF. 17/8 EC-JQF ATR 72-201 Swiftair; T7-AWO Falcon 50; N166CK Falcon 7X. 18/8 **OM-FWW Premier 1**; OO-VRO Falcon 2000LX. 20/8 T7-BRS Global 6000; LX-JFB PC-12. 21/8 YU-SCJ CitationJet 1. 24/8 SP-ATT Beech 400XP; PH-MDG Citation 680 Sovereign+. 25/8 N977RS Avanti; T7-MAB A319-133CJ; **RA-64010 Tu-204-300.** 26/8 **N625AS 737-790 routing Seattle-Bangor-Luton-Tel Aviv for freighter conversion, ex Alaska Airlines.** 27/8



**Beech 18 (Expeditor 3TM) N184KP c/n CA-130 arrived at Glasgow Airport on September 15 and departed two days later. It was on delivery to the Classic Formation organisation in Grenchen, Switzerland, where it will join two more Beech 18s and a DC-3.** Iain Mackenzie



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EC-ISQ Citation 560XL. 30/8 C-FRHZ Global 6000; 0002 Gulfstream G550 1 BLT, Polish AF; P4-NMD Gulfstream IVSP. 31/8 A6-ADL Legacy 650.

## LONDON SOUTHEAST

2/7 D-ALOA Legacy 650. 6/7 LX-JFW PC-12 f/v. 7/7 D-EWNA Zin Z-42 f/v, dep 10th. 8/7 EC-MFJ 717-2CM Volotea Airlines also 15th & 22nd. 11/7 LX-JFS PC-12 f/v; EI-FMY A319-111 Volotea Airlines. 14/7 D-ITIM HondaJet type f/v, n/s; D-BUZZ Citation 750 X n/s. 15/7 OO-DFJ Mooney M.20J; FAB-107 RJ70 Bolivian AF f/v, ex T7-KMA. 18/7 LX-TAC Phenom 300; D-CFAF Learjet 60. 19/7 D-CGGG Learjet 31A; YL-RAG Saab 340A/F RAF-Avia. 20/7 D-CAAM Do.228-212 Arcus Air. 21/7 D-BOOC Citation 750 X. 22/7 D-BUZZ Citation 750 X n/s. 26/7 D-CAAM Do.228-212 Arcus Air. 27/7 D-EEWD Beech F.33 n/s. 31/7 5Y-CHD HS.748-2A moved to Trygon Aviation hangar area for scrapping, ex N748D.

## MANCHESTER

1/8 D-CHEC Citation 680 Sovereign f/v. 2/8 C-GEOQ 767-375ER Air Canada Rouge f/v; 2-MSTG Citation 510 Mustang f/v. 5/8 LY-DSK Hawker 850XP f/v. 6/8 D-CAGA Phenom 300 f/v. 9/8 B-7835 787-9 Hainan Airlines f/v. 12/8 SP-ATT Beech 400XP f/v; OM-FTS CitationJet 525A CJ2 f/v. 13/8 N480CH BBJ1 f/v. 14/8 B-7880 787-9 Hainan Airlines f/v; SE-ROD A320-251N SAS f/v; LY-GTW 737-4Q8 Getjet Airlines f/v, op for Norwegian. 17/8 9H-GGF Citation 560XLS f/v. 18/8 B-1546 787-9 Hainan Airlines f/v. 22/8 SE-ROC A320-251N SAS f/v; **D-AIKS A330-343E Lufthansa f/v**; D-AGBF Falcon 7X f/v. 24/8 **D-AIKL A330-343E Lufthansa**. 25/8 B-1543 787-9 Hainan Airlines f/v; SE-ROA A320-251N SAS f/v; PH-CJM Citation 680 Sovereign f/v; LX-JFY PC-12 f/v. 26/8 G-DHLE 767-3JHF DHL Worldwide for painting at Air Livery; S5-ICR Citation 560XL f/v; OE-GHB Citation 560XLS f/v. 27/8 D-CKHK Citation 560XLS+ f/v. 29/8 SE-DOZ A320-251N SAS f/v; 30/8 TF-FIG 757-23APF Icelandair Cargo, East Midlands diversion.

## NORWICH

1/6 OE-GKW Gulfstream G100; EC-LOF BAe 146-300QT ASL Airlines dep ex Air Livery, also at Air Livery 21/6-11/7. 2/6 D-FBVB PC-12. 4/6 VP-FAZ DHC-6-300 British Antarctic Survey; **A6-FDC 737-8KN FlyDubai to KLM Maintenance**. 6/6 D-AGWQ A319-132 Germanwings to Air Livery, dep 17th. 8/6 EI-RJE RJ85 CityJet to KLM Maintenance; OO-DWB RJ100 Brussels Airlines to KLM Maintenance; 2-TBXU



**Pilatus PC-6/B2-H4 N488WY, registered to Flexible Flyer, at Prestwick on September 21.**  
David Townsend

A321-131 dep ex Air Livery; D-AGWP A319-132 Germanwings dep ex Air Livery. 9/6 PH-EUE AW139 CHC Helicopters Netherlands; **A6-FDF 737-8KN FlyDubai dep ex KLM Maintenance**; D-IVIP Beech 200. 10/6 YR-TIB 737-3L9 Air Bucharest also 17th; N827MD E170SU to Air Livery, dep 30th. 12/6 N694BC E190IGW dep ex Air Livery. 13/6 **A6-FDD 737-8KN FlyDubai dep ex KLM Maintenance**. 16/6 YL-BBW Dash 8-Q402 Air Baltic to Air Livery, dep 25th; 2-PLAY TBM 700. 17/6 G-XXRS Global XRS dep ex Air Livery. 19/6 PH-CDF 737-804 Corendon Dutch Airlines to KLM Maintenance dep 1/7; D-CIRJ Do.328-110 MHS Aviation to Air Livery, dep 26th; SE-DSR RJ100 Malmo Aviation dep ex KLM Maintenance; EI-RJC RJ85 CityJet to KLM Maintenance. 22/6 D-CHIP CitationJet 525B CJ3+. 26/6 N737M BBJ1 to Air Livery. 27/6 D-CMMP Phenom 300; PH-CTR Citation 680 Sovereign. 28/6 C-FPSH Do.228-202; A6-RJ1 RJ85 Dubai Air Wing to KLM Maintenance. 29/6 N754BC E190IGW dep ex KLM Maintenance; OE-FHC CitationJet 525A CJ2+ also 30th. 30/6 B-8269 Gulfstream G550.

## PRESTWICK

1/7 02-0202 C-40C 201st AS, DC ANG; 63-8018 KC-135R 173rd AS, Ne ANG dep 5th; UR-KDM An-12BK Cavok Air. 2/7 UR-CKL An-12BP Cavok Air; 59-1459 KC-135R 2nd ARW, USAF n/s. 4/7 07-7175 C-17A 436th/512nd AW, USAF n/s; 62-3500 KC-135R 26th ARS, WI ANG n/s; 59-1476 KC-135R 92nd ARW, USAF n/s; 177704 CC-177 429 TS, RCAF. 5/7 130605 & 130609 CC-130Js 436 TS, RCAF n/s. 6/7 N738MA 737-8Q8 Miami Air; 91-1238 C-130H 165th AS, Ky ANG; 84-00488 & 84-24380 C-12Us E/1-214th Avn, US Army; 165152 C-20G VR-51, USN n/s. 8/7 85-1362 C-130H 181st AS, Texas ANG n/s. 9/7 KAF343 C-17A 41 Sqn, Kuwait AF n/s also 12-14th & 28th n/s; 900530 C-26D AOD Sigonella. 10/7

HB-IVJ Gulfstream G650. 11/7 165349/JW C-130T VR-62, USN; 94-6703 C-130H 182nd AS, IL ANG dep 14th; 82-0191 KC-10A 60th/349th AMW, USAF n/s. 12/7 85-0030 KC-10A 305th/514th AMW, USAF; **N159EM, N258EM, N259EM & N262EM L-159Es Draken International all routing Leeuwarden-Keflavik**; LZ-ABJ An-26B Rose Air; 85-0027 KC-10A 305th/514th AMW, USAF. 13/7 08-8606 C-130J-30 & 87-9283 C-130H 758th AS, AFRC; 92-1451, 92-1452 & 93-7312 C-130Hs 182nd AW, IL ANG. 14/7 06-6168 C-17A 436th/512nd AW, USAF. 15/7 F-GSQL 777-228ER Air France technical diversion, passengers collected by F-GSQL; 97-0048 C-17A 89th AS, 445 AW, USAF. 17/7 N821SY 737-8FH Sun Country Airlines; N749MA 737-8Q8 Miami Air also 26th. 18/7 08-5693 C-130J-30 39th AS, 317th AG, USA; **D-FIBE PC-6/B2-H4 undertaking photo surveys**. 19/7 91-1236 C-130H 165th AS, Ky ANG n/s; 165151 C-20G CFLSW, USN. 20/7 09-0004 VC-32A 1st AS, 89th AW, USAF; N757AF 757-2J4ER DJT Operations. 21/7 00-0110 C-32B 150th SOS, NJ ANG; 99-0165 C-17A 89th AS, 445 AW, USAF n/s; 79-1950 KC-10A 60th/349th; AMW, USAF dep 23rd. 22/7 84-0191 KC-10A 60th/349th AMW, USAF; YL-RAA An-26B RAF-Avia. 23/7 07-7174 C-17A 436th/514th AMW, USAF n/s. 25/7 79-0475 & 79-0476 C-130Hs 120th AS, Mi ANG both n/s; 92-3023 & 92-3024 C-130Hs 757th AS, AFRC both n/s; 87-0124 KC-10A 305th/514th AMW, USAF n/s; 177705 CC-177 4379 TS, RCAF dep 27th. 26/7 CH-11 C-130H 15 Wing, Belgian Defence – Air Component. 27/7 10-00259 & 10-00261 C-12Vs Det 1 Co/2-228th Avn, US Army; 03 C-17A NATO SAC. 28/7 **SP-YRL Cub Crafters Cub EX2**. 29/7 UR-82009 An-124-100 Antonov Airlines; VT-IAH A319-115X(CJ). 30/7 59-1505 KC-135R 134th ARW Tn. ANG; 169036 C-40A VR-61, USN.

Key. f/v first visit; n/s night stop; o/s overshoot.

**Air Austral Boeing 777-39M(ER), F-OREU, was at Edinburgh Airport on September 14 operating an ad-hoc charter flight from Oslo.**



With thanks to: D Apps, D Banks, D Bougourd, S Boyd, J Brazier, N Burch, P Claridge, A Clarke, I Cockerton, KW Ede, M Farley, N French, P Gibson, D Graham, A Greening, J Gregory, G Green, I Grierson, D Haines, M Harper, K Hearn, G Hocquard, B Hunter, S Lane, G Morris, S Morrison, R Richardson, R Roberts, E Russell, RJ Sayer, M Shepherd, A Smith, D Turner, JA White, G Williams, Blackpool Aviation Society, Manston Movements, Solent Aviation Society/'Osprey', South Wales Aviation Group, CIAN, GSAE, The Aviation Society, EGPE ATC, www.dtmovements.co.uk, Aerodata Quantum Plus and RHADS.



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# REGISTER REVIEW

The latest changes on the UK, Irish, Isle of Man, Guernsey and Jersey registers.



**A new Boeing 787-9 Dreamliner for Norwegian is G-CKNA which has had its tail painted with an image of the singer Freddie Mercury from the rock band Queen.** Mark Stevens

## RESTORATIONS

REG'N	MODE(S)	TYPE	C/N	OWNER
G-BTKW	40342B	Cameron O-105	2566	LJ Whitelock, (Bristol)
G-BUAG	40354B	Jodel D18 (built by AL Silcox)	PFA 169-11651	PA Silcox, (Rumby Hill, Crook, Co. Durham)
G-BVZY	4073FA	Mooney M.20R Ovation	29-0045	Hansengroup Ltd, Liverpool John Lennon, Merseyside
G-CFAC	4008BC	Avro RJ100	E3379	Triangle Regional Aircraft Leasing Ltd, Cranfield, Bedfordshire
G-IKUS	404A44	Comco Ikarus C42 FB UK (built by CI Law)	PFA 322-14130	WP Hearn, (March, Cambridgeshire)
G-MWAJ	402FFA	Murphy Renegade Spirit UK (modified) (built by J Hall)	PFA 188-11438	LD Blair (Artigarvan, Co. Tyrone)
G-WENA	40217A	Aérospatiale AS355F2 Ecureuil 2	5260	Aviation Support and Training GmbH, Zweibrücken, Germany
El-BSX	Not allotted	Piper J3C-65 Cub	13255	J O'Dwyer, (Naas, Co. Kildare)
El-DDU	4CA209	Airbus A330-203	463	Celestial Aviation Trading 45 Ltd, (stored at Tarbes-Lourdes, France)

## NEW REGISTRATIONS

REG'N	MODE(S)	TYPE	C/N	OWNER
G-CKEO	40735E	Airbus Helicopters EC135T3	2021	Airbus Helicopters UK Ltd, Oxford, Oxfordshire
G-CKKL	4073E8	Boeing 787-9 Dreamliner	63311	Norwegian Air UK Ltd, London Gatwick, West Sussex
G-CKLU	407418	Lindstrand LTL Series 1-425	054	Lindstrand Technologies Ltd, (Oswestry, Shropshire)
G-CKMN	40741E	Lindstrand LTL Series 1-105	060	MA Derbyshire, (Whittington, Shropshire)
G-CKMS	406DA6	Lindstrand LBL-400A	1103	Flying Circus SL, (Madrid, Spain)
G-CKNA	4073D4	Boeing 787-9 Dreamliner	389784	Norwegian Air UK Ltd, London Gatwick, West Sussex
G-CKNX	40742C	Ozone Buzz Z4 ML/Parajet VI Macro Trike	BZ4ML-0-36C-015/000367	IA Callaghan, (Davidstow, Cornwall)
G-CLUK	407427	Schleicher ASK-23B	23043	London Gliding Club Proprietary Ltd, Dunstable Downs, Bedfordshire
G-DHKL	40128A	Boeing 757-28A	28161	DHL Air Ltd, Leipzig, Germany
G-EVIB	407401	Cirrus SR22	2467	P Bishop, Goodwood, West Sussex
G-GTSD	4073FE	P & M Quik GT450	8766	P Bayliss, Ince Blundell, Merseyside
G-IASB	407377	Beech 250i (built by Textron Aviation Inc)	BY-278	IAS Medical Ltd, Durham Tees Valley, Co. Durham
G-IINK	4073D2	Cirrus SR22	4187	NP Kingdon, Exeter International, Devon
G-JALS	4073C5	Cessna 560XL Citation XLS+	560-6024	Air Charter Scotland Ltd, Biggin Hill, Greater London
G-JMRT	4073BA	Comco Ikarus C42 FB80 Bravo	1705-7502	Kennedy Tuck Air Ltd, Gloucestershire
G-KMLA	4073E9	Cirrus SR20	1763	KML Aviation OY, Kuopio, Finland
G-MEPS	4072B9	Embraer Phenom 100	50000377	Affinity Flying Training Services Ltd, RAF Cranwell, Lincolnshire
G-MGBG	4018D5	Cessna 310Q	310Q0110	Cotswold Aero Maintenance Ltd, Cotswold, Gloucestershire
G-MOOD	406FAC	Comco Ikarus C42 FB100 Bravo (assembled by Red Aviation)	1509-7418	R Moody, (Alnwick, Northumberland)
G-MRAG	40738C	Cessna 182T	18282414	AS Gardner, Coventry, Warwickshire
G-NFVB	40734E	Cameron Z-105	12107	Ballooning Network Ltd, (Bristol)
G-OENC	40738D	Leonardo AW189	89002	Bristow Helicopters Ltd, Aberdeen International, Aberdeenshire

G-OUAV	407410	TLAC Sherwood Scout	LAA 345-15480	University of Southampton, (Southampton, Hampshire)
G-OVEG	407415	Diamond DA 20-C1 Katana	C0121	Tungsten Group Ltd, (London EC2)
G-PICU	407386	Leonardo AW169	69055	Specialist Aviation Services Ltd, Gloucestershire (for Children's Air Ambulance)
G-POPZ	407416	Druine D31A Turbulent	LAA 048-15494	SA Blanchard, (Cottingham, Humberside)
G-RKAG	40619E	Diamond DA 40D Star TDi	D4.255	Airways Aviation Academy Ltd, Huesca-Pirineos, Spain
G-SBCB	407102	Cirrus SR22T	0523	CR Barr, (Coffinswell, Devon)
G-SLNG	407404	TAF Sling 4	LAA 400-15477	RSD Wheeler and RJH Davis, (London SW6 & London W9)
G-TCAA	4071EB	Leonardo AW169	69038	Specialist Aviation Services Ltd, Gloucestershire (for Children's Air Ambulance)
G-VGDS	4073BB	Cameron Z-90	12094	Western Commodities Ltd, (Willand, Devon)
G-VNAM	4073FF	Cessna 305A Bird Dog	21666	O-1 Aviation Ltd, Membury, Berkshire
G-VONY	4073BC	Cessna T182T	T18208662	WS Stanley, Home Farm, Ebrington, Gloucestershire
G-ZOMB	4073C4	Comco Ikarus C42 FB100 Bravo	1705-7504	Apocalypse Aviation Ltd, Chiltern Park, Ipsden, Oxfordshire
El-FYF	4CABA9	Boeing 737-8 MAX	42829	Hardangerfjorden Ltd, Oslo Gardermoen, Norway (operated by Norwegian Air International)
El-GCK	4CA87A	Dassault Falcon 7X	168	Minsheng Jiade (Ireland) Designated Activity Company, (Dublin)
El-GCM	4CA02B	Boeing 737-8KN	40233	AWAS Aviation Leasing (40233) Ltd, (for Jet Airways as VT-JTH)
El-SLW	4CA8CC	ATR 72-202(F)	232	ASL Airlines (Ireland) Ltd, Paris-Charles de Gaulle, France
El-STK	4CA7FA	Boeing 737-448(BDSF)	25052	ASL Airlines (Ireland) Ltd, Dublin
M-ARIA		Dassault Falcon 2000EX	136	Group Murr Aviation IM Ltd, Geneva, Switzerland
M-ATEX	43EAE9	Dassault Falcon 8X	421	Maritime Investment and Shipping Company Ltd, Geneva-Cointrin, Switzerland
M-DSUN	43EAF6	Bombardier Global 6000	9758	Splendiferous Global Ltd, Hong Kong-Chep Lap Kok, Hong Kong Special Administrative Region of the People's Republic of China
M-ETAL	43EAE1	Piaggio P180 Avanti	1194	GFG Aviation Ltd, Gloucestershire
M-IBAL	43EAF1	Airbus A320-232	2737	TC Skyward Aviation Ireland Ltd, (stored at Teruel, Spain)
M-LAAA	43E950	Bombardier Global Express XRS	9443	ALM Jet Ltd, London Luton, Bedfordshire
M-ORAT	43EAEF	Dassault Falcon 7X	147	Swift New Jet Ltd, TBA
M-ORZE	43EAE6	Eurocopter EC135P2+	0684	G650 Management Ltd, TBA
M-SETT	43EAF5	Bombardier Global 5000	9782	Lodging 2020 LP Inc, Tel Aviv-Sde Dov, Israel
M-SURE	43EAF4	Dassault Falcon 7X	155	Airang Aviation IOM Ltd, Dhaka-Hazrat Shahjalal International, Bangladesh
M-YGJL	43EAE0	Bombardier Global Express	9033	Ansaki Aviation Two Ltd, TBA
2-AUER	43EBE5	Cirrus Vision SF50	0014	Euro Aircraft Leasing Ltd, Guernsey
2-DBCV	TBA	ATR 72-202(F)	669	Elix Assets 14 Ltd, Sonderborg, Denmark
2-RLAS	TBA	Boeing 777-31H	29062	SASOF III (B) Aviation Ireland DAC, (stored Teruel, Spain)



## CANCELLATIONS

REG'N	TYPE	C/N	REASON
G-AOFR	de Havilland DH.82A Tiger Moth	86356	To Norway as LN-SVG
G-AWDA	Nipper T.66 RA45 Series 3	S117	Cancelled by CAA (Permit to Fly current to 17.11.17)
G-BCLT	SOCATA MS.894A Rallye Minerva 220	12003	Cancelled as Permanently WFU (crashed near Kolt, Jutland, Denmark 08.09.16)
G-BCLW	Grumman AA-1B Trainer	AA1B-0463	Cancelled as Permanently WFU (CoFA expired 09.06.13. On display at South Yorkshire Aviation Museum, Doncaster, South Yorkshire)
G-BIKA	Boeing 757-236	22172	Cancelled as Destroyed (flown to Madrid-Barajas, Spain 24.12.16 for storage and parting out)
G-BIKM	Boeing 757-236	22184	Cancelled as Destroyed (flown to Madrid-Barajas, Spain 26.12.16 for storage and parting out)
G-BMVM	Piper PA-38-112 Tomahawk	38-79A0025	Cancelled as Destroyed (crashed on take-off at Lower Wasing Farm, Brimpton, Berkshire 14.06.17)
G-BNIM	Piper PA-38-112 Tomahawk	38-78A0148	Cancelled as Permanently WFU (CoFA expired 02.04.11, Broken up at Perth, Perth & Kinross 02.17)
G-BSMK	Cameron O-84	2328	Cancelled as Permanently WFU (CoFA expired 22.07.17)
G-BSRD	Cameron N-105	1568	To Germany
G-BXJC	Cameron A-210	4191	To Mexico
G-BXUS	Sky 65-24	111	Cancelled as Destroyed (CoFA current to 26.10.17)
G-CDOG	Lindstrand LBL Dog	938	Cancelled as Permanently WFU (CoFA expired 06.05.15)
G-CDWP	P & M Quik GT450	8173	Cancelled as Destroyed (Permit to Fly expired 17.07.17)
G-CFNG	Schleicher ASW-24	24015	Cancelled as destroyed (crashed near Brentor, Dartmoor, Cornwall 04.12.16)
G-CHWV	Baldwin Quad	1008076	Cancelled as Permanently WFU (SSDR microlight, no CoFA or Permit required)
G-CICE	Reflex Wings Paramania Revo 2/ Bailey Quattro Plus	0810122/281	Cancelled by CAA (SSDR microlight, no CoFA or Permit required)
G-CIYI	Maule MX-7-235 Super Rocket	10012C	To USA
G-CJJI	Avro RJ100	E3336	Cancelled as Permanently WFU (Parted out at Cranfield, Bedfordshire 08.17, fuselage roaded to Cotswold, Gloucestershire and scrapped)
G-CJJO	Britten-Norman BN-2B-20 Islander	2313	To Germany as D-IFLB
G-CJKD	Rolladen-Schneider LS8-18	8215	To Germany
G-CJZS	Airbus Helicopters EC135T3	2016	To Ministry of Defence as Juno HT1 ZM516
G-CKCS	Grob G.120TP-A	11128	To Ministry of Defence as Prefect T1 ZM310
G-CKEO	Airbus Helicopters EC135T3	2021	To Ministry of Defence as Juno HT1 ZM518
G-CKJD	VTC Standard Cirrus 75-VTC	241	To Czech Republic
G-CKNH	Cirrus SR22T	0523	Re-registered as G-SBCB
G-DDKT	Eiri PIK-20B	20155C	To Germany
G-DSTT	Cessna 172M	17266228	To Hungary
G-FAMH	Zenair CH.701 STOL	PFA 187-13301	Cancelled as Permanently WFU (substantially damaged in a heavy landing at London Colney airstrip, Hertfordshire 22.06.14)
G-FORC	Stampe SV4C	665	To Germany

## PREVIOUS IDENTITIES

REG'N	P.I.	REG'N	P.I.
G-BVZY	ex OE-KGG	G-VNAM	ex N5074G
G-CFAC	ex HB-IYU	G-VONY	ex PH-MIK
G-CKMS	ex S5-OHM	G-WENA	ex (D-H...)
G-CLUK	ex PH-767	EI-DDU	ex TC-JNF
G-DHKI	ex N286DH	EI-GCK	ex M-DTBP
G-EVIB	ex N192SR	EI-GCM	ex A6-FDC
G-IASB	ex N278BY	EI-SLW	ex HB-AFK
G-IINK	ex OK-STL	EI-STK	ex OY-JTI
G-JALS	ex M-AKAL	M-ATEX	ex F-WWQU
G-KMLA	ex N164SR	M-DSUN	ex N758JF
G-MEPS	ex PR-ING	M-ETAL	ex N191LW
G-MGMG	ex N727MB	M-IBAL	ex PR-MBB
G-MOOD	ex G-HARL	M-LAAA	ex M-AAAL
G-MRAG	ex N122CS	M-ORAT	ex VP-CSX
G-MWAJ	ex EI-EYN	M-ORZE	ex SP-WWW
G-OENG	ex I-RAIW	M-SETT	ex C-FRYO
G-OVEG	ex N961CT	M-SURE	ex F-HPVE
G-PICU	ex I-EASI	M-YGJL	ex N600AK
G-RKAG	ex JY-BBB	2-DBCV	ex D4-CBV
G-SBCB	ex G-CKNH	2-RLAS	ex A6-EMM
G-TCAA	ex I-EASJ		

G-GLBX	Bombardier Global Express	9120	To USA as N1409A
G-HARL	Comco Ikarus C42 FB100 Bravo	1509-7418	Re-registered as G-MOOD
G-JECH	Bombardier Dash 8-Q402	4103	To Canada as C-FWUC
G-JYAK	Yakovlev Yak-50	853001	To USA
G-LLWW	Gulfstream G650	6253	To USA as N999HX
G-MBBB	Skycraft Scout Mk.2	0388W	Cancelled as Permanently WFU (SSDR microlight, no CoFA or Permit required)
G-MBCK	Eipper Quicksilver MX	GWR-10962	Cancelled as Permanently WFU (SSDR microlight, no CoFA or Permit required)
G-MBJF	Hiway Vulcan/Sky-Trike 250	80-00099	Cancelled by CAA (SSDR microlight, no CoFA or Permit required)
G-MJKO	Gold Marque Gyr 188/Farnell 250	90039P	To Bulgaria
G-MJMR	Solar Wings Typhoon/Mainair Tri-Flyer 250	DR-01	Cancelled as Permanently WFU (SSDR microlight, no CoFA or Permit required)
G-MNIM	Maxair Hummer	PJB-01	Cancelled as Permanently WFU (SSDR microlight, no CoFA or Permit required)
G-MVGH	Aerial Arts Chaser S 447	CH722	Cancelled as Permanently WFU (Permit to Fly expired 05.06.07)
G-MVVP	Solar Wings Pegasus XL-Q	SW-WQ-0228	Cancelled by CAA (Permit to Fly expired 08.04.12)
G-MWSL	Mainair Gemini Flash IIA	835-0491-7-W629	Cancelled as Permanently WFU (Permit to Fly expired 11.06.98)
G-MWXW	Cyclone Chaser S	CH830	Cancelled as Permanently WFU (Permit to Fly expired 07.06.07)
G-MYVE	Mainair Blade	1027-0295-7-W825	Cancelled by CAA (Permit to Fly expired 08.03.15)
G-MZTS	Aerial Arts Chaser S 447	CH703	Cancelled as Permanently WFU (Permit to Fly expired 07.06.08)
G-ONIK	Aeropro EuroFOX 912(1)	BMAA/HB/665	Cancelled as destroyed (details unknown, Permit to Fly current to 15.03.18)
G-RWLY	Europa Aviation Europa XS	PFA 247-13701	Cancelled by CAA (no Permit to Fly issued, believed not completed)



**Bombardier Global Express G-GLBX is now registered in the US as N1409A.** AirTeamImages.com/Javi Sanchez Utzet



## UPDATES &amp; CORRECTIONS

REG'N	DETAILS
G-ATOM	Became HA-BAM 07.17
G-AVZN	Became LZ-PTA 09.09.15
G-BCCC	Became LZ-BCC 29.02.16
G-BIDF	Became LZ-RDT 25.10.12
G-BUWJ	Became OK-PIT 22.06.17
G-BXFB	Type officially changed to a Pitts S-1C (Modified) 31.07.17
G-BZSC	Type officially changed to a Replica Sopwith Camel F1 21.08.17
G-CBNB	Became F-HJUR 24.07.17
G-CBYC	Became LZ-CBY 23.06.15
G-CBZW	Type officially changed to a Zenair CH.701 25.07.17
G-CCCN	Became D-HLKH 24.07.17
G-CCRB	Type officially changed to a Kolb Twinstar Mk.III (modified) 08.08.17
G-CEDT	Type officially changed to a Tanarg/Xess 15 912S(2) 26.07.17
G-CEYO	Became ZK-IDR 28.07.17
G-CFZA	Became SP-4003 27.06.17
G-CGKA	Became GO-1 Finnish Air Force 11.16
G-CHIO	Became OK-0015 13.07.17
G-CIGK	Became C-FVSI 12.07.17
G-CIGL	Became C-FVSD 12.07.17
G-CIJP	Became N644BL 25.07.17
G-CIWW	Type officially changed to a Sackville BM-56 22.08.17
G-CJHF	Builder officially changed to SF Ducker, PF Nicholson and PJ Fincham 16.08.17
G-CJIF	Became LN-OID 28.03.17
G-CJLM	Type officially changed to a Kitfox Mk.4 (Modified) & builder to G Birnie-Esselmont, K Blunt, C Kinder and T Neale 31.07.17
G-CKGS	Manufacturer officially changed to Comco Ikarus GmbH 18.08.17
G-DCMG	Became SP-3973 06.06.17 (actually cancelled by CAA 11.07.16)
G-DOIT	Became ZK-IFI 04.07.17
G-DRBG	Became LZ-GIN 14.03.17

REG'N	DETAILS
G-EYAS	Became U-Y26 (Thai ultralight register)
G-FELM	Became F-HELM 04.08.17
G-GFCM	Became HA-BEN 07.17
G-GFFD	Became EX-37501 23.12.11
G-GMAB	Became F-HOSP 27.07.17
G-HAMM	Became LN-SFA 25.07.17
G-JAMA	Became OK-ASS 19.06.17
G-KIMS	Manufacturer officially changed to Comco Ikarus GmbH 11.08.17
G-MVEN	Type officially changed to a Shadow Srs.CD (Modified SS) 03.07.17
G-MVYS	Became N823WL 29.08.17
G-MWIF	Type officially changed to a Rans S.6-ESD (modified) SS 25.8.17
G-MYAF	Type officially changed to a Pegasus XL-Q (Modified) 14.07.17
G-OURS	Became N826LA 14.08.17
G-PAFC	Became SP-BKA 12.06.17
G-PHCJ	Became N678AR 22.08.17
G-RECE	Became LZ-RSD 15.07.15
G-SCVF	Became EI-GCJ 21.07.17
G-SMRT	Became LZ-SMR 17.06.15
G-VJAB	Became LZ-JAB 14.08.13
G-YFZT	Became LZ-UGB 26.05.16
M-ABFR	Became 1325 UAE Air Force
M-ALIK	Became AP-ALI 05.17
M-IRIC	Became VT-JTE 19.05.17
M-KENF	Became N3438F 01.08.17
M-PRVT	Became P4-TEN 08.17
M-TEAM	Became N609CJ 15.08.17
2-HIGH	Became D-EWGM 11.04.17
2-ISBA	Became VQ-BDB 04.17
2-RLAO	Correct p.i. is F-WTDY

G-SIMI	Cameron A-315	3391	To Mexico
G-SMTH	Piper PA-28-140 Cherokee C	28-26916	Cancelled as Permanently WFU (CofA expired 02.05.17, last noted stored at Bournemouth, Dorset 08.17)
G-SUNA	Gefa-Flug AS 105 GD	0010	Cancelled by CAA (caught fire in flight and crashed at Erin, Wisconsin 16.06.17)
G-TBAE	BAe 146-200	E2108	Cancelled as Permanently WFU (CofA expired 07.04.14, parted out Summerside, Canada 08.14)
G-TELC	AutoGyro MT-03	RSUK/MT-03/028	Cancelled as destroyed (crashed in a field at Whitebridge Road, Carrickmore, Co. Tyrone 07.05.17)
G-VLCN	Avro Vulcan B.2	12-XH558	Cancelled as Permanently WFU (Permit to Fly expired 20.05.16. Stored at Doncaster Sheffield Robin Hood, South Yorkshire pending display)
G-WENA	Aérospatiale AS355F2 Ecureuil 2	5260	To Germany
G-XLSR	Cessna 560XL Citation XLS+	560-6202	To Slovak Republic as OM-BLS
EI-DBW	Boeing 767-201	23899	Cancelled at Owner's Request - Removed from Service (impounded at Rimini, Italy 21.10.15 and now parted out)
EI-EYN	Murphy Renegade Spirit	PFA 188-11438	To United Kingdom as G-MWAJ
EI-FNP	ATR 72-212A	715	To South Africa as ZS-AFJ
EI-GCK	Dassault Falcon 7X	168	To Peoples Republic of China

EI-GCL	Airbus A320-214	4815	To India as VT-DEL
M-AAAL	Bombardier Global Express XRS	9443	Re-registered as M-LAAA
M-ABKX	Avro RJ100	E3382	To Libya as 5A-FLE
M-AKAL	Cessna 560XL Citation XLS+	560-6024	To United Kingdom as G-JALS
M-ALRV	Dassault Falcon 2000EX	173	To USA as N255JE
M-ATEX	Dassault Falcon 900EX	250	To France
M-DTBP	Dassault Falcon 7X	168	To Republic of Ireland as EI-GCK
M-JETI	BAe 125-800B	258056	To Aruba as P4-JET
M-MDMH	Embraer Phenom 300	50500116	To Germany
M-OPDE	Dassault Falcon 7X	30	To USA as N67EA
M-ORAD	Dassault Falcon 2000LX	101	To USA as N101VQ
M-SEAS	Bombardier Global 5000	9461	To Canada as C-GJET
2-ATTF	Airbus A319-112	734	To USA as N390UA
2-KKZE	Fokker 70	11576	To Myanmar Air Force as 002
2-QMEF	Boeing 767-306ER	27960	To USA as N140SA
2-RLAM	Airbus A321-212	891	To USA as N322WS
2-SKAD	ATR 72-212A	777	To Indonesia as PK-PAH
2-TBXV	Boeing 737-8Q8	30690	To Thailand as HS-NGO
2-TBXW	Boeing 737-8Q8	30693	To Thailand as HS-NGP

Key: NB – Nominal Base

A place name in brackets relates to the owner's address as where the aircraft is based is unknown.



This Bombardier Dash 8-Q400 was operated by Flybe as G-JECH, but has now left the UK register and is C-FWUC. AirTeamImages.com/Ralf Meyermann



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# TWO DECADES OF DISMANTLING

**Adrian M Balch** reports from Kemble, Gloucestershire on Air Salvage International which has 20 years experience in aircraft disassembly.



**R**ecord rates of airliner production by Boeing and Airbus almost inevitably leads to an equally high level of aircraft withdrawals. Worldwide, around 600 passenger aircraft are retired from service each year.

Most go to Marana, Mojave, Goodyear, Victorville, Kingman and Roswell in the southwestern USA; all are swollen with vintage jets of the 1980s and 1990s that have no future in the skies. Break-up rates at these places is comparatively slow, since there is no pressing need to re-use the space occupied by an old jet.

It's a different story in the UK. Storage capacity is often at a premium, leading recyclers to work at a much more rapid pace to salvage parts and chop up withdrawn airliners.

Bruntingthorpe Airfield in Leicestershire, and Cotswold Airport (Kemble), near Cirencester, are the prime airliner 'retirement homes' in the UK.

## ANNIVERSARY

Air Salvage International (ASI), at Kemble, was a hive of activity when the author visited. The company is a globally respected provider of professional asset management services to banks, lessors, insurance companies and airlines.

The business has experience of more than 700 projects worldwide over the last 20 years with its disassembly services at the industry's forefront, contributing to developing the Aircraft Fleet Recycling Association's (AFRA) Best Management Practices (BMPs).

Projects have been undertaken across the globe, including in Togo, New Zealand, Dubai, Sudan, Ecuador, US, Libya, the Maldives and Egypt.

ASI is in its 20th anniversary year of trading, having grown from humble

Above: **Former Air France Airbus A340-311, F-GLZH, awaits disposal with all usable parts removed.** All photos by the author, unless stated

Below: **Fuselage of Indonesian carrier Kalstar Aviation's ATR 42, PK-SSF was ferried to Kemble under a Guernsey registration 2-KKSF for disposal.**





An aerial view of ASI's compound at Cotswold Airport last April. Ian Haskell



beginnings where founder, Mark Gregory, worked from a small site in Hampshire. The company now employs 45 staff, and disassembles around 10% of the global aircraft part-out market, either at Kemble or airports across the world.

The business grew slowly in the early years but has gone from strength to strength as demand for recycled aircraft rose, coupled with a string of high-profile customers. As well as a fully accredited, quality assured

service, ASI's customers can benefit from using two subsidiary companies, Skyline Aero (component supply) and GCAM (EASA 145 approved maintenance), at the same Cotswold site. The three businesses complement each other, and provide the likes of lessors and banks with a unique 'one-stop-shop' when evaluating asset optimisation.

Chief Executive Mark Gregory said: "I am fully aware that ASI's success was not achieved alone. It has been down to the

collaborative effort by a great and committed team, and strong customer loyalty, for which I am very grateful."

During the visit to the company's facilities on September 21, aircraft were in various stages of disassembly. They are initially dismantled in a hangar, where a former Irish operator's ATR 42 was observed having small components and engines removed, which were catalogued and stored for recycling. Once that work is done, the aircraft are moved outside for breaking up.

The compound was lined with Boeing 737s, 747s, BAe 146s, ATR 42s and a former Air France Airbus A340.

## VALUES

Mark advised that an Airbus A320, depending on the manufacturer's serial number (c/n), was worth between \$1.2m and \$12m, with recycled spares removed to support airliners currently in service. Undercarriages are particularly valuable, most being sent to specialist companies to be examined and refurbished for re-use.

There are more Boeing 747s than any other type currently being withdrawn and former Saudia and Cathay Pacific aircraft were being dismantled. An ageing 747-400 ►

ASI staff cutting up wing sections in September.







Latest arrival at the time of the author's visit in September was Airbus A319, Z-FJE, of Zimbabwean airline fastjet with engines and parts starting to be removed.



VIP fit Boeing 727-269, M-FTOH is kept in running order. It was used for a period by the Kuwait government.

is worth about \$5m, depending on engine type. Once the engines have been removed, the value will drop by 80 to 90%.

A Boeing 747 takes 15 weeks to take apart, removing around 500 reusable and recyclable parts. The airframe can then be broken up in two days.

Boeing 737s and A320s take four to six weeks to break up, which results in 1,200 parts of value, following which the airframe takes two weeks to dispose of. There is a recycle rate of 98% from an A320.

All removed parts are catalogued and stored in 180,000sq ft (16,722sq m) of climate controlled component/engine storage hangarage.

Parts are also used by film companies and

colleges for training purposes. Others will go to museums, while large parts of airframes can be used by the Ministry of Defence (MOD), police or fire service as tuition aids.

The company has supplied numerous fuselages over the years for use in films including Hollywood blockbusters such as *Fast & Furious 6*, *World War Z*, *Batman*, *Mission Impossible*, and *Star Wars*.

Recent TV work for the BBC includes *Horizon*, *The One Show*, *Inside Out*, *Terror in the Skies?*, and *Engineering Giants*. Sky TV and the Discovery Channel have also used the company's services.

Two former Thai Airways Boeing 777s were among aircraft being worked on during the visit. One was about to have the top

half of its fuselage cut away and refurbished for use as a cabin simulator for a major European airline.

An additional service offered by ASI is to go to crash sites to recover airframes and assess what can be recycled.

## CONCORDE

ASI also assists museums with big moves. In 2004 it was awarded a prestigious contract by British Airways to dismantle, move and rebuild two Concorde.

Concorde, G-BBDG, was disassembled at Bristol-Filton and transported to the Brooklands Museum in Surrey, where it was reassembled. A similar operation was carried out with Concorde G-BOAA, which relocated



Former Saudia Boeing 747-4HG, TF-AAE, leased from Air Atlanta, awaits its turn to be broken up.





An aerial view of Cotswold Airport with ASI's compound bottom right and two hangars centre right. Ian Haskell

from Heathrow Airport to the National Museum of Flight at East Fortune, near Edinburgh. Both are on display at these museums.

RAF Nimrod R1, XV249, flew into Kemble,

where its wings were removed before the aircraft was transported by road to the RAF Museum at Cosford. The wings were then refitted ready for display.

Similar tasks have been carried out on more than 30 aircraft to date for insurance companies, loss adjusters, museums and private individuals.

Mark said: 'As airliners are returned from lease, 50% of them that arrive are more than 15 years old now and are being retired.'

All work is approved by the Civil Aviation Authority and aircraft arriving are de-registered and registered as required. At Kemble, there is parking space for up to 50



Above: A pair of Boeing 737 noses, a former Monarch Airlines Boeing 757-2T7, G-DAJB and Thai Airways Boeing 777-2DTER, N175GT (HS-TJF) in various stages of disposal.

Below: Irish ATR 42, EI-SLA, in one of ASI's hangars during initial dismantling of all reusable parts.



**'Concorde, G-BBDG, was disassembled at Bristol-Filton and transported to the Brooklands Museum in Surrey, where it was reassembled'**

narrow/20 widebodied aircraft, with constant pressure to 'turn around' the latest arrival in order to accept another retiree.

Newest addition at the time of the visit was a Zimbabwe-registered Airbus A319 of fastjet, withdrawn by the leasing company.

One interesting aircraft on site that was not going to be scrapped, and which is potentially airworthy, was Isle of Man registered Boeing 727-269A, M-FTOH (c/n 22359). The aircraft has had an eventful





Above: An aerial view of ASI's hangars last February showing a variety of types. Ian Haskell

Below: Former Thai Airways Boeing 777-2D7ER, HS-TJF, with ferry registration N176GT in August. Note that the engines have been removed.



career, being initially delivered to Kuwait Airways in September 1980. It was then transferred to the Kuwaiti government in February 1989.

On August 2, 1990, it was seized by the invading Iraqis at the outbreak of the first Gulf War before being liberated by the allies and returned to Kuwait in October of the following year and restored to Kuwait Airways.

Converted to VIP configuration with a sumptuous interior, it was bought by the Al Futtooh Investments Company in March 2000. Re-registered as N169KT, it was immediately acquired by the Strong Aircraft Holding Company and placed on the Isle-of-Man register as M-FTOH on April 5, 2012. It was flown in to Kemble on June 29, 2016 as part of a deal with ASI CEO Mark Gregory, who now owns it.

It has remained grounded ever since, but is kept in full running order with all systems operational.

Mark said: "The aircraft could be for sale if anyone wanted a 727", which is still in full, luxurious VIP fit inside. For the time being, he is proud to show off the aircraft as a ground exhibit.

With ASI's track record the company can look forward to a bright future. **AN**

**The next issue will be a Stealth special and will be on sale on November 16, 2017\***

\*UK scheduled on sale date. Please note that the overseas deliveries are likely to be after this date.



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